INDIAN FOOD INDUSTRY

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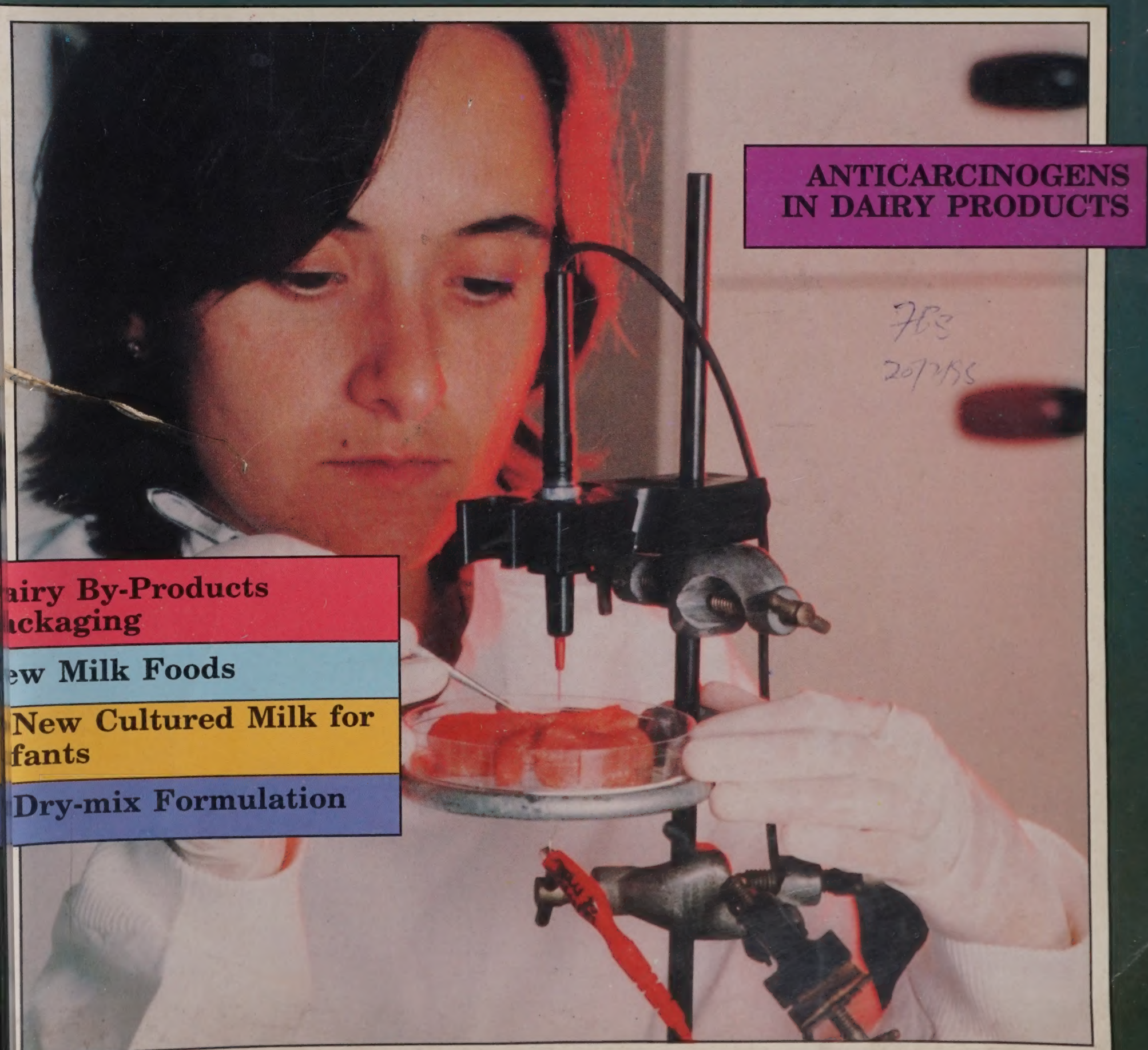
A PUBLICATION OF ASSOCIATION OF FOOD SCIENTISTS AND TECHNOLOGISTS (INDIA)



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Telephone : 515557 - Fax : 518670 - E-mail afsti@blr.vsnl.net.in

- Affiliated to the Institute of Food Technologists, Chicago, Illinois, U.S.A.
- The Association is a professional and educational organization of Food Scientists and Technologists, with its headquarters at Mysore.
- The Chapters of the Association are located at Bangalore, Bhopal, Calcutta, Chennai. Delhi, Hisar, Hyderabad, Jabalpur, Jaipur, Jammu, Kanpur, Karnal, Kharagpur, Ludhiana, Manipur, Mumbai, Nagpur, Pantnagar, Parbhani, Pune, Thrissur, and Thiruvananthapuram.

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- Advancement of all the aspects of Science and Technology relating to Production, Processing and distribution of food, with the ultimate objective to serve humanity through better food.
- Promotion of research, development and training in the Science, Technology and Engineering of Food.
- To provide a forum for exchange, discussion and dissemination of knowledge and current developments, especially among Food Scientists and Technologists as well as the Public and Society at large.

Major activities:

- Publication of 'Journal of Food Science and Technology' (bi-monthly) and 'Indian Food Industry' (bi-monthly).
- Holding symposia/conventions on different aspects of Food Science, Technology and Engineering.
- Arranging Lectures and Seminars for the benefit of Members and the Public.

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- Membership is open to graduates and diploma holders in Food Science, Technology and Engineering as well as to those engaged in these professional activities.
- Types of membership include Life Member, Life Member (Resident Abroad), Corporate Member, Full Member, Member (Resident Abroad), Affiliate Member, Student Member and Student Member (Abroad).
- Each member will receive a free copy of the '*Journal of Food Science and Technology*' or '*Indian Food Industry*', as per the option exercised.

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With this background, it is needless to say that the journal is poised to play a significant role in the development of Food Industry in our country. Therefore, to be a part of this venture, become a subscriber by remitting your subscription fee in the form of DD drawn in favour of Hony.Exec. Secretary, AFST (I) for the regular supply of this popular and prestigious journal.

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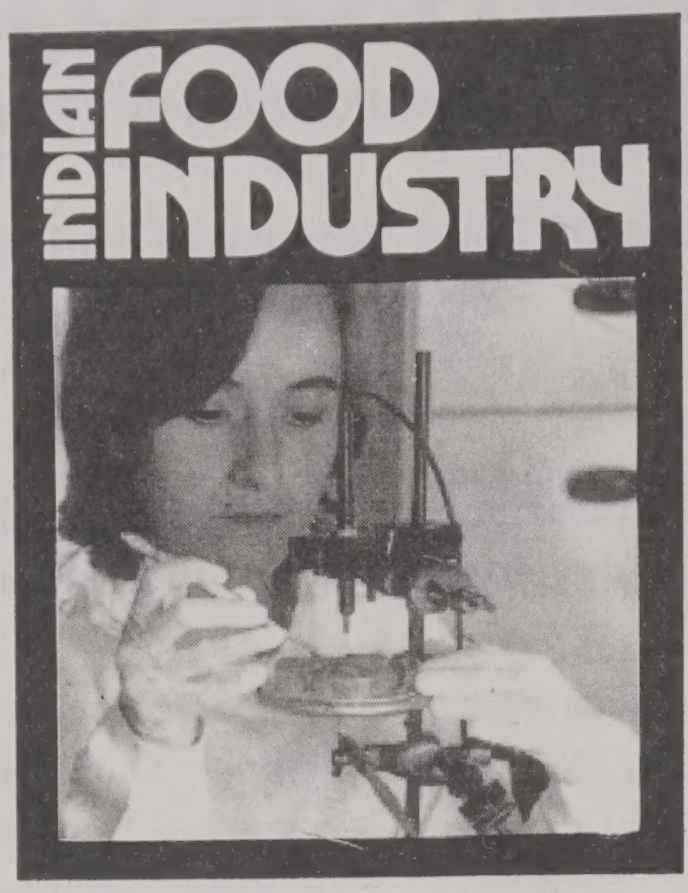

Cover :
A Scientist at work in the Laboratories of Dentron Ltd.
(See page 51)

Courtesy :
British High Commission

Indian Food Industry (ISSN-0253-5025) is a bi-monthly publication of the **Association of Food Scientists and Technologists (India),** devoted to give extensive coverage to technological and market developments relevant to food industries in India.

Review articles, technology papers based on R&D work and reports on various aspects concerning food industry are welcome from food scientists and technologists from industry, research institutions and other related organisations. Contributors are advised to provide good quality illustrations in the form of charts and photographs along with the manuscripts. The Editorial Board reserves the right to edit the manuscripts in order to make them suitable for publication in the journal, while assuming no responsibility for the statements and opinions expressed by the contributors, nor will they bind AFST(I) in any way. Readers are free to air their views through letters which may be published in the journal from time to time.

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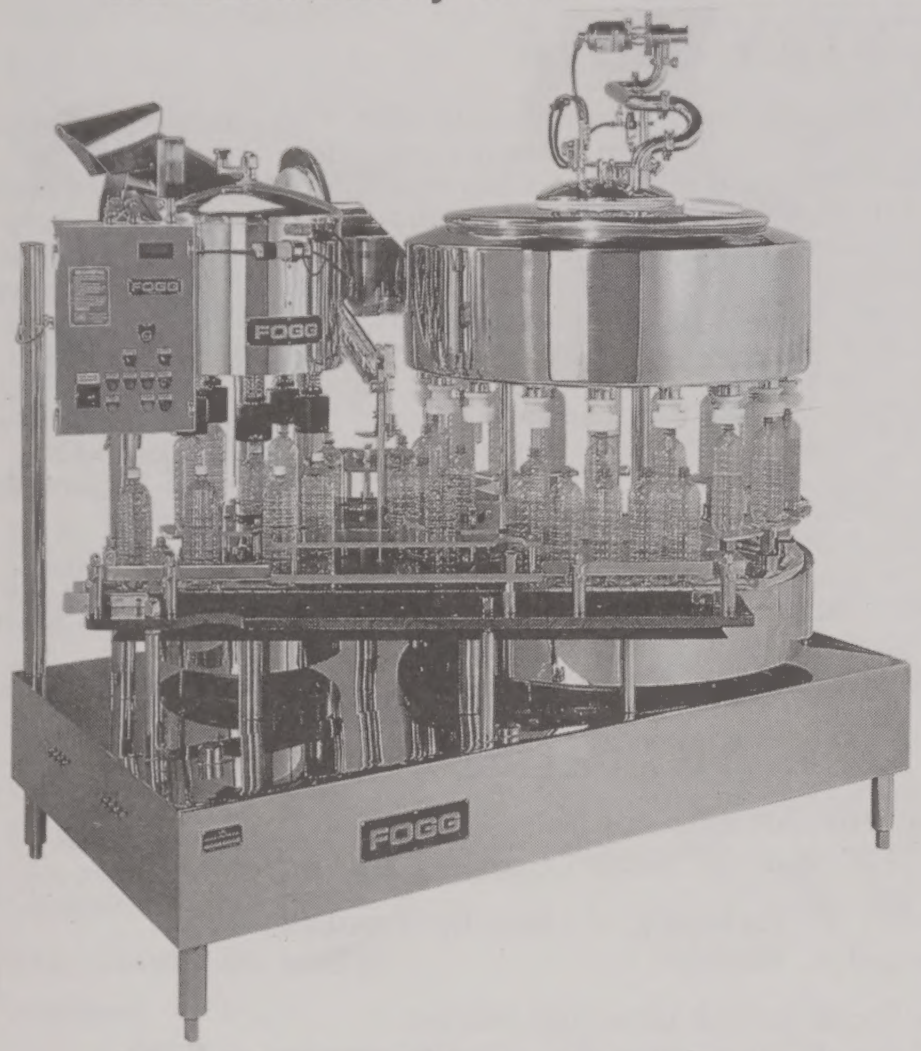

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THE CHIEF EDITOR'S DESK

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Here is some eye-popping news - for certain eye infections, human milk works wonderfully, to cure the ailment, of course. I am aware of this as a home remedy and not as a standard practice in organized modern-day clinics. Human milk possibly has both anti-inflammatory and anti-microbial factors that it has been considered appropriate for such a delicate organ as the eye. Donkey's milk is fed to new-born babies in some communities, obviously for some beneficial effects. So, milk apparently has therapeutic and health promoting values and is not merely a protein food. Milk is also a source of Omega-3 and Omega-6, fatty acids that are of nutraceutical value. Since nature designed cow's milk for calves, it is not adequate with respect to Omega-3 and Omega-6 fatty acid profiles to meet human infant's needs. This is the reason why breast feeding is insisted upon at least for some time. Pattnaik and colleagues at NDRI have written an interesting article on anticarcinogenic factors found in milk and milk products (p. 19). While milk as such may have some of these factors, fermentation by lactic acid bacteria seems to enhance the spectrum of such factors. The longevity of (100 plus years)of certain communities, in a Russian village has been attributed to regular consumption of yoghurt (fermented milk). These multifarious values of milk remain less investigated so far.

Milk production in India during 1996-97 touched 68 million tonnes and according to Dr. M. L. Madan, Deputy-Director General (Animal Sciences) of ICAR, within the next couple of years, it will exceed even that of the USA and India will then become world's largest milk producer. Excellent prospects! Milk, not merely for its protein, fat, cheese, confectionery and the like that are of significant commercial value, the other yet unharnessed values will also have to be exploited. It would do well for Food Industries to turn their attention in this direction.

May I take this opportunity to wish all our subscribers/ members/advertisers/readers a happy and prosperous ***New Year 1998 ?***

Richard Joseph

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INDUSTRY NEWS

Irradiation Displays Scare Consumers in USA

The food industry wants to see less prominent display of statements and symbols on food containers and packages that now indicate the products inside have undergone radiation treatment to kill bacteria.

The industry has been working for quiet congressional passage of legislation to limit the size of disclosures about irradiation on the label to type no bigger than the print used in the list of ingredients.

It is assumed that the "radura," an international symbol that resembles a flower and is now used to mark food as irradiated, also would undergo a downsizing.

"We believe you can inform consumers, but we don't believe it should be a warning label that people should be concerned about what they are eating," said **John Cady**, President of the **National Food Processors Association**.

Irradiation uses ionizing radiation to kill microorganisms in food such as *Salmonella* and *E.coli* as well as fungus, mould and parasites. The **Food and Drug Administration**(FDA) has approved the method for poultry, pork, some vegetables, grains and spices and astronauts'space meals.

The Agriculture Department and at few U.S. companies that irradiate stress that the process is a safe one that does not harm food or make it less nutritious. Opponents of the process argue that the possible long-term effect on humans of eating irradiated foods is unknown.

Because of the unfounded fear that irradiating food makes it radio-active, the process has been used sparingly in the United States.

The FDA requires that processors display on packages prominently and conspicuously a written statement and the 'radura'.

Cady, in a briefing to reporters, said the required labeling, especially the radura, which reminds some of an upside-down mushroom cloud, scares off consumers and makes irradiated products unmarketable.

The proposed label change, which was approved by the Senate as part of Food and Drug Administration reform legislation and is expected to pass in the House, infuriates irradiation opponents who have been fighting the marketing of any irradiated food over the last decade by staging boycotts and extracting pledges from food manufacturers that they won't use the treatment.

"This will put consumers at an extreme disadvantage in the marketplace", said **Michael Colby,** Executive Director of **Food &Water Inc.,** an anti-irradiation group. "This is very deceitful because for the last 12 years, irradiated food labeling had to be prominently displayed and the public avoided it".

Caroline Smith DeWaal", Director of food safety for the **Center for Science in the Public Interest,** called the proposed change a "sneak attack" on informative food labeling that will be done without seeking consumers' views or holding congressional hearings.

Ironically, advocates of irradiation sometimes promoted the labeling requirement as a way to stress the safety of irradiated food. "Clear, reassuring labeling, including the 'Radura', has been a positive factor in changing consumer attitudes toward irradiated foods", says a brochure published by the **American Spice Trade Association**, whose members account for the largest volume of foods treated.

To alert the public to the proposed label change, Food & Water ran newspaper ads in Burlington, Vt., saying Sen. **James M. Jeffords**(R-Vt.)Chairman of the **Senate Labor and Human Resources Committee**, is "offering legislation that will make it easier to sneak irradiation into your food supply".

A spokesman for Jeffords said the ads were"a bunch of lies".

The FDA has not approved irradiation of red meat, although it has been considering the issue for three years. After the recent recall of millions of pounds of hamburger by **Hudson Foods Inc.**- the meat was thought to be tainted by *E.coli*- the industry redoubled efforts to get red meat irradiation approved.

Recently, the Food Processors Association wrote to the FDA urging quick approval of red meat irradiation, saying "consumer interest in food safety has finally overcome years of unfounded concerns about the food irradiation process". The food industry also stressed that irradiation is a better way to eradicate *E.coli* than expanding the government's recall authority, a step the **Agriculture Department** is promoting.

An FDA official said that when an irradiation request is submitted, the agency"has to do every worst-case scenario to see if there is a safety problem under some conditions. We are not at that point yet". The agency said it doesn't have a timetable for approving the petition. But

Rep.**Greg Ganske** (R-Iowa) does, and he says he likes to eat his hamburgers medium rare without worrying. He introduced the Hamburger Safety Act on Sept.16,1997 to prod the FDA to get going on the petition. One of the FDA reform bills in the House contains a provision for speeding the approval.

Food safety groups said the legislative maneuvers won't persuade consumers to accept irradiated food.

"If there was no danger, it wouldn't matter if[the notice] was on the front of the label. The industry knows darn well consumers don't want and won't support irradiation on fresh foods", said **Rodney Leonard**, Executive Director of the Community Nutrition Institute.

The industry thinks consumer acceptance would come, if the government gave stronger support to irradiation and launched a consumer education program.

"You have to come out as a public health and safety agency and explain this is a good tool", said Cady, of the food processing association. "If it's good enough for astronauts, why the hesitancy on the part of public agencies to approve this?" he asked.

Source : Washington Post

Nestle to Stop Selling 'Magic' Candy in USA

Nestle USA declared that it would stop selling a controversial candy product featuring a small Disney toy inside a chocolate-covered plastic ball that critics said was a danger to children.

A Nestle USA spokeswoman said that the company still believes that its Nestle Magic candy is safe but had decided to voluntarily withdraw it from the market because of "an unresolved technical, legal problem" relating to a 1938 federal law prohibiting "non-nutritive objects" inside confections.

"The absence of a final resolution of this legal issue has created an unfavourable environment to market the product", said Frank Arthofer, President of Nestle USA's confections division.

The company acted after informing the Consumer Product Safety Commission of a dozen incidents in which children reportedly had gagged on the toys, small figures based on popular Disney cartoon characters, like Hercules and Simba.

The Food and Drug Administration also had informed the company that it was not retreating from its claim that the candy violated the 1938 law.

The candy, which sells for about $1, had provoked a furore among consumer groups and state attorneys - general. But after federal agencies were slow to move against the product, the normally secretive Mars Inc. of McLean, another major candy company, launched a strong lobbying attack on the product.

Connecticut State's Attorney General-Richard Blumenthal, who had been in the vanguard of Magic critics, said that when the 14 attorneys general opposed to the product learned that Nestle had filed reports of seven gaggings on the toys, they warned Nestle they would make the information public. "There wasn't much debate about it", he said.

The company said in a statement that there had been a total of 12 incidents of youngsters gagging on the toys reported to federal officials. But spokeswoman Laurie MacDonald said that none was serious enough to require medical attention and added : "We stand by the product's safety".

Blumenthal said, however, that the gagging reports indicate that the attorneys-general were right to warn about the product "before Nestle Magic could become Nestle tragic".

"This really is a victory for parents and children all across the country", said Rep. Rosa L. DeLauro (D-Conn.) a leading congressional critic of Nestle. She told reporters that the candy represented "the height of corporate arrogance". She praised the chocolate maker. "I congratulate Nestle for doing the right thing", she said.

Nestle officials said that the magic product was in stores across the country and could not give any estimate as to the number of products that would be recalled or the cost to the company.

Source : Washington Post

New Oilseed Crops Help Ease Edible Oil Prices

Steady arrivals of the new oilseeds crop have pushed down domestic edible oil prices and imports from Malaysia and South America.

"Edible oil prices have reached the bottom level because domestic arrivals have picked up", Bombay Oilseeds and Oil Exchange President Navinbhai Shah said. "Imports have also come down and are expected to be less during November and December".

The Solvent Extractors'-Association of India, a leading industry body, said the country imported 1.72 million tonnes of edible oil in the 1996-97 (November-October) season compared with 1.20 million in 1995-96.

"Imports surged because the prices were lower this year, and as a result, consumption increased", Association Executive Director B.V. Mehta said.

Traders said palmolein oil in the domestic market was quoted at Rs. 27,000 ($736) per tonne and groundnut oil at Rs. 34,800 per tonne.

"About 150,000 bags of groundnut in shell are arriving in the Saurashtra region every day", Mr Shah said. "In the central markets, 100,000 bags of soybean is arriving every day". (One bag equals 70 kg).

Saurashtra in Gujarat, contributes nearly 35 per cent to India's groundnut output. Madhya Pradesh accounts for about 80 per cent of the country's soybean.

Trade officials said the government's decision to free edible oils trade from the storage controls limit would help the industry to stock adequately.

Bulk Export of Edible Oils May be Allowed

In yet another move towards liberalising the edible oilseeds industry, the Union food ministry has mooted a proposal to the commerce ministry to allow edible oil exports in bulk. For a country facing shortage of edible oils, this is a radical departure from the mind-set of the past.

Today, in the edible oil category only groundnut oil exports are permitted and that too only upto 5 kg consumer packs. The food ministry has recommended exports of all edible oil in bulk except groundnut oil which should continue to be exported in 5 kg packs. This is because the government wants to offer a level playing field to the industry.

The Solvent Extractors'-Association (SEA) Executive Director, Mr B. V. Mehta said that this proposal has been supported in all quarters. Even the World Bank report has mentioned that exports should be allowed.

Industry sources said that the government wants to deregulate the edible oil industry by removing all restrictions, but in stages. First, the government allowed the vanaspati industry to use expeller oil, next it removed the storage control order and now it is contemplating opening up the edible oil industry to the export market.

However, traders said that depending on the price parity between the domestic and international market, only the branded oil exporters will be able to grab the niche markets such as West Asia and Russia and get a premium. But, the cost of oil packaging and interests would make the exports expensive.

Traders agree that exports may not actually result in recovery of prices which have been depressed for the past few months. The exporters will have to study the various markets in terms of quality requirements and preferences. Traders cited an example that coconut oil could fetch a good price in West Asia because of the presence of a large expatriate population.

Storage Control Order on Edible Oils and Oilseeds Withdrawn

In a significant move towards liberalisation of the oilseeds industry, the Union government has rescinded the storage control order on oilseeds and edible oils. It was implemented under the pulses, edible oilseeds and edible oils (storage control) order, 1977.

The storage control order empowered the State Governments to impose stringent stock-holding limits to edible oils as well as invoke the penal provisions under the Essential Commodities (Special Provision) Act, 1981 against traders engaging in speculative activities in times of shortages.

"With this step in the right direction, the Government has accepted the long pending demand of the trade and industry", said Mr Govindbhai Patel, Chairman of the Central Organisation for Oilseeds Industry and Trade.

He pointed out that this will provide a great relief to the industry and trade from unnecessary harassment from various agencies and would also remove hindrances in efficiently marketing of their produce by oilseeds farmers.

The decision of abolishing the storage control order appears to have been promoted by the easy availability of edible oils in the country on account of higher domestic production and free imports.

The scrapping of storage control order also leaves little possibility for malpractices by traders by way of hoarding.

Bombay Oilseeds and Oils Exchange President, Mr Navinchandra Shah told media persons that lifting of the order will give a psychological relief to the traders.

Earlier traders had faced a limit of 80 tonnes of edible oil, but now the traders can freely store as much as they want.

The main purpose of storage control order was to discourage hoarding but was actually ineffective.

Withdrawal of the order will help streamlining the trade. He said that the extraction units can now take advantage of the market situation and indulge in heavy buying during the peak season, which they could not do earlier.

Hindustan Lever's Continued Success in Consumer Goods Market

Hindustan Lever has retained its position for the sixth year in succession as the country's "most admired marketing company" among marketers of fast moving consumer goods (FMCG), according to the annual A & M-ORG-MARG survey.

Among the first 30 FMCG companies are five newcomers, while a number of companies lost their rankings, thus reflecting the jostling among companies to adjust to the changing demands of the market place in the present era of liberalisation. P & G which has been in the news recently with a flurry of new product launches gained four places to emerge as runners up.Cadbury maintaining the trend of regularly introducing new products continued with the third rank and Nestle slid to the fourth place after occupying the runners up slot last year.

Among the two Cola majors, Pepsi is placed fifth and Coca Cola ninth. The positions in between them are occupied by Colgate Palmolive, Lakme Lever and Pond's respectively. The tenth position has been occupied by Britannia and the 11th by the once tinsel edged ITC whose image has been on a continuous decline ever since board room differences came out in the open. As a result, it lost the second spot it occupied in 1994. Among the fully owned Indian companies, Amul is placed 13th, and Dabur is 15th, followed by Raymond.

Hindustan Lever's Export Turnover

Hindustan Lever Ltd (HLL), expects its export turnover to touch the $350 million figure this calendar year. In 1996, the company's gross exports stood at Rs. 921 crores or roughly $255 millions. HLL's export basket can be broadly divided into three categories : Beverages and Foods, Home and Personal care Products (HPC), and others.

Of the total $350 millions, beverages and foods will account for a third netting the company about $110 millions. HPC is expected to bring in $40 millions, while marine products will contribute about $90 millions, leather $30 millions with the balance coming from items like thermometers and agri - commodities like mushroom, rice etc.

HLL Beverages Exports Division functions out of Bangalore, where the category team for Central Asia/Middle East markets is based.

Of the $100 millions beverages exports, $90 millions will come from tea and $10 millions from coffee. Foods will account for another $ 10 millions.

HLL's tea exports are expected to rise 33 per cent in volume terms in 1997 over 1996. This will translate into a 40 per cent growth in value terms. Based on current trends, HLL expects to account for over 20 per cent of India's overall tea exports by value.

HLL has identified packet teas, tea bags and instant teas as the thrust area for exports. HLL exports speciality teas to Japan and Germany. These are mainly Darjeeling teas, which are used mainly as gift items.

For traditional Assam CTC teas of high quality, Middle East has been strong market for HLL for over two decades. The new markets which are being targeted are Syria, Jordan, Iran and Yemen, which are currently the stranglehold of Sri Lankan teas.

HLL, for beverages exports is also focussing on Central and East European markets. Countries like Russia, Ukraine, Central Asian Republics, Baltic states are shifting from state trade to commodity brands and now to consumer led brands. HLL, through Unilever in these markets has launched Brooke Bond Red Label and Lipton Yellow Label variants.

Liptonice, a ready-to-drink beverage which is formulated using the instant tea produced at Etah, is gaining share in the EEC and Latin American markets.

Talks are on to extend the Etah produced product to the USA as well. HLL's instant tea plant at Etah was commissioned last year and is already running at full capacity.

The beverages export business is supported in Bangalore by the Beverages Innovation Centre.

HLL's impressive beverages exports push this year has been supported by a bullish year for Indian tea.

While South India had a good year both crop and price wise, North Indian tea crop covered up the shortfall in the third quarter. With strong demand in all major markets, HLL expects the current trend of firm prices to prevail in the first half of 1998 as well.

Cuts in Coffee Exports Foreseen

The Association of Coffee Producing Countries (ACPC) expects cut in that coffee exports by its members in 1997-98 (June-July)

would be 3.85 million bags below the planned level of 52.75 million bags.

ACPC President Rubens Barbosa of Brazil told reporters that the reduction in expected availability was in particular due to the adverse effect of recent weather patterns, including the *el nino* phenomenon.

The ACPC said in a statement that "in the course of the meeting, the central American countries reaffirmed the reductions made in their expectations of availability and that they would not export more than 8.42 million bags, a reduction of 0.5 million bags".

In addition, Brazil also declared that it expected to export no more than 13 million bags of green coffee, a reduction of 2 million bags.

Indonesia restated its expectations that it would export no more than 5 million bags, a reduction of 0.85 million bags.

African countries do not expect to export more than 11.5 million bags a reduction of 0.5 million bags. Therefore, there would be a total reduction in availability of 3.85 million bags in relation to the export programme.

Indian Exports Hit by Global Sanitary Regulations

The current International norm, which treats each country as a unit for farm and animal products export-sanitation, is harming the interests of big countries like India according to Dr. Ram Badan Singh, Director of the Indian Agricultural Research Institute (IARI).

He said that India and other affected countries should press for changing the norm to confine the restrictions only to affected regions.

Dr. Singh pointed out that export of Indian mangoes to sophisticated markets of Europe, America and Japan was barred by international phyto-sanitation norms because the fruits from some pockets of the country were affected by fruit fly larvae bore into the fruit. Similarly, meat and meat products from India are prevented by several countries as animals in some areas are susceptible to the rinder pest and foot and mouth diseases.

Dr. Singh said that incidence of diseases in some pockets was holding up export of such produces from the entire country. The real sufferers of such restrictions are the farmers from disease-free regions.

He said further India's view point in this regard would be brought before the plant diseases scientists from 31 countries coming to an International conference on Integrated plant disease management at New Delhi. Developed countries like USA, UK, Netherlands, Germany, France and Canada are prominant participants in the New Delhi Meet. He said in countries like France where agriculture is well developed and organised, a certification from the local farmers society was good enough for the export markets that buy the produce from France.

Indian export farmers would have to organise the local producers committees to authenticate the sanitary condition of the crop or the animal produce. This is essential, if Indian farm exports are to find its logical position in the post-GATT farm commodities trade.

Import of More Sugar Despite Abundant Stocks

Despite abundant domestic stocks, the Union Government is considering a proposal to immediately import upto 5 lakh tonnes sugar for the public distribution system chiefly because ports will be able to handle it.

In a note sent by the commerce ministry for the Cabinet's approval, it has been suggested that the Government should immediately import sugar because ports are relatively free to handle large cargoes at present. Later, the ports will be busy handling imported wheat, making it difficult for them to deal with imported sugar as well.

The commerce industry has also pointed out that India should take advantage of the low international prices at present. Interestingly, the commerce ministry did not consult the food ministry on the actual necessity of sugar imports while formulating this proposal.

In fact, the proposal contradicts the food ministry's official stand that there is sufficient free sale sugar available domestically, which can be bought, when the need arises to meet the PDS requirements.

The food ministry further maintains that the option of getting sugar on loan from domestic millers would be preferable rather than entering the world market and using valuable foreign exchange. The ministry has already received a fresh proposal from the private sector sugar mills on how to arrive at a mutually satisfactory price of the stocks purchased by the government.

Foodgrain Production Target May Go Against Estimation

Foodgrain production in the country is estimated to fall short of the target of 193.50 million tonnes for 1996-97 by two million tonnes, the agriculture ministry warned even while ruling out any shortfall in availability during 1998.

The ministry has, however, set an ambitious target of 198 million tonnes for 1997-98 as against 193.5 for the current year and targets to achieve an average growth rate of 4.5 per cent by the end of the current plan period in 2002 AD.

"The sustained bounty rainfall experienced in the country during the last few years and expectations of the current trend are indications enough to be optimistic of the growth target for agriculture," a senior agriculture ministry official said.

Forays have been made into promotion of cropping systems approach for increasing production and productivity of cereal crops as a whole against the individual cropping approach.

The Centre is also encouraging the use of soil ameliorants for improving soil health and soil productivity.

For bringing down the cost, the farmers are being encouraged to use organic manures, which may provide an opportunity to recycle the farm wastes in a manner, which will not only lower the cost of production but will sustain the agriculture production.

While rice production during the current year was expected to reach 80.54 million tonnes against a target of 81 million tonnes, wheat production may fall short, reaching 60.71 million tonnes as against a target of 65 million tonnes. The total foodgrain production would reach 190.12 million tonnes this year.

However, the output of coarse cereals is slated to rise to 34.07 million tonnes as against a target of 32.5 million tonnes.

The soil and water conservation division in the department of agriculture and cooperation has launched an action plan for increasing biomass production and cropping intensity to maximise the crop productivity and production. The soil and water conservation division will implement a Centrally sponsored scheme with a budgetary provision of Rs. 1.50 crores for soil conservation and other schemes.

Food Shortages in Africa and Asia May Continue : FAO

Acute food shortages have gripped 29 countries, mostly in Africa, a United Nations Agency has reported.

Though the cereal production in the developing countries is expected to decrease only slightly from last year's good level, the countries facing shortages have gone up from 25 to 29, Food and Agriculture Organisation (FAO) said in a recent report.

Eighteen of the affected countries are in Africa, five each in Asia and eastern Europe and one in Latin America.

Adverse weather, FAO says, is the main cause for short supplies in most countries though civil strife and economic reforms too play a significant part.

FAO experts believe that effects of *el nino* weather phenomenon are expected to peak in next few months and it may pose threat to crops planted in coming months for next year's harvest.

The FAO report says the widening gap between the haves and the have-nots is the most disturbing trend and must be reversed.

In many Asian countries, the *el nino* effect could lead to a delay in rice plantation resulting in a switch over to early maturing, but lower yielding varieties. Preliminary indications point towards reduced rice acreage in some countries of the southern hemisphere.

There is considerable concern over the possible adverse impact on 1998 coarse grain crop in southern Africa.

Experts predict a strong possibility of poor rainfall for the planting season which is soon to start. Accordingly, most governments have prepared comprehensive contingency plans, FAO says. The report also analyses how the fisheries and forestry sectors may be affected. Global supplies of cotton and jute, it says, do not appear likely to be affected, but production of some hard fibres may decline in event.

Among its recommendations are reducing deforestation and increasing use of improved livestock and crop management practices to reduce carbon dioxide, methane and nitrous oxide emissions.

Rice Production Affected by Bacterial Blight

The Bacterial blight disease is destroying several rice varieties in North India, including "Pusa basmati", a dwarf aromatic rice introduced amidst high expectations in the country.

Caused by "xanthomonas pryzae", the disease is affecting production of rice in nearly three lakh to five lakh hectares of land, scientists from the Directorate of Rice Research (DRR) in Hyderabad said.

During the past three years, epidemics have been reported in Punjab, Haryana and Western Uttar Pradesh on several rice varieties including "Jaya", "PR 106", "Pusa 44-35 " and "Pusa basmati".

Severe epidemics have been reported in Andhra Pradesh, Karnataka and Madhya Pradesh, in some commercial varieties including "Krishnaveni", "Chaitanya" and "Rasi". Bacterial blight has also been observed in severe form in isolated areas of West Bengal and Assam on "IR36", "Pankaj", "Swarna" and "Savithri".

A recent disappointment is "Pusa basmati", a dwarf, high-yielding non-lodging variety that flowers early and has high fertiliser requirement. The variety is being grown in 1-2 per cent of the estimated 0.7 million hectares of rice-growing areas in Punjab, Haryana and West Uttar Pradesh.

A large part, nearly 45 per cent of the rice growing areas in these States are under cultivation of traditional basmati varieties that grow under low levels of nitrogen fertilisers and flower late.

Although traditional non-dwarf basmati varieties too are susceptible to blast and leaf blight disease, the problem did not erupt on a large scale as their cultivation was restricted to a few pockets.

The new variety, introduced in the North in 1992, is in great demand by farmers of the region as it fetches two to three times higher price than ordinary varieties in the domestic market.

It also proliferates quickly and its quick spreading habit, combined with conditions favourable for pathogen growth have led to disease outbreak, according to IARI scientists.

Greater losses are being incurred this year as the weather conditions, especially the unusual spells of rain in the past few months, have been conducive to rapid spread of the disease.

Haryana is one of the States affected by the bacterial blight disease in 1997. Rice is grown as a kharif crop (July to October) in the north - a time when weather conditions are conducive for disease outbreaks.

Bacteria's Invincibility Increasing!

Bacteriologists attending a recent congress in Worcester, England, learnt much about little beings but little for their comfort. All over the world, they were told, growing numbers of bacteria have developed resistance to antibiotics, which were once regarded as a miracle weapon in the battle against bacteriological infections.

Nor is there, at present, any prospect of new medicines which might solve the problem, at least in the short term. As a consequence, some infectious diseases can no longer be cured.

In the US, Spain, Portugal and Greece, for example, as many as 40 per cent of the dangerous pyrogens *Staphylococci aurei* no longer react to oxacillin, previously considered a highly effective antibiotic.

In 1995, a major survey carried out by the Paul Ehrlich Society for Chemotherapy (PESG) found that bacteria had grown to resist many antibiotics, in some cases markedly so, in German speaking countries.

Michael Kresken, Coordinator of the PEG survey, says the growing resistance to antibiotics coincides with the increasing frequency with which they are prescribed.

In West German hospitals for example, the quantity of antibiotics prescribed rose by 28 per cent between 1986 and 1995. And yet each antibiotics prescription increases the risk that the resistant bacteria will survive and establish new generations of especially dangerous pathogens.

Paradoxically, it progresses in the fields of medicine and hygiene that is mainly to blame for the decline in effectiveness of antibiotics.

Average life expectancy has risen, leading among other things to an increase in the number of infections treated with antibiotics. Moreover, doctors perform more and more operations on elderly or particularly weak patients, sometimes saving their lives, but often triggering infections which, in turn, can only be brought under control by the use of antibiotics.

Antibiotic-resistant bacteria, which survive treatment in such cases, may well find themselves in a virtually bacteria-free zone, especially in intensive care wards, which provide ideal conditions for them to multiply, at great risk to patients. In healthy people, on the contrary, it would be hard for the bacteria to take its toll, because their numbers would be held in check by rival bacteria.

Resistant *Staphylococcus aureus* germs, spread quickly especially when a touch of the hand suffices, but if they are resistant to oxacillin, there are hardly any other medicine capable of countering them.

Kochi to Open Pepper Futures Exchange

The much-awaited international pepper futures exchange was expected to start regular operations in August, 1997 in Kerala.

The India Pepper and Spice Trade Association (IPSTA), the body promoting the exchange, is presently in the process of finalising the selection of banks, which have shown interest in equity participation in the clearing house of the exchange - 'the First Commodity Clearing Corporation of India' (FCCCI).

FCCCI is the authorised body, which provides guarantee for every contract entered into by the exchange. According to IPSTA sources, financial institutions and banks should account for 45 per cent of FCCCI's total Rs. 5 crore equity capital. The contribution is limited to a minimum of Rs. 10 lakhs and a maximum of Rs. 50 lakhs for each bank.

Though membership was open to both Indian and foreign traders, unless and until government allowed free flow of funds in and out of India, the exchange was not likely to attract foreign members. Formal government sanction for repatriation of profits and capital was expected by the time the exchange starts operations. An IPSTA delegation proposed to visit pepper producing nations to promote the exchange since no foreign participant had sought membership so far.

With the commencement of operations of the international exchange and clearing house guaranteeing the contracts, the volume of trade was expected to go up from the present one million quintals a year to as much as 10 million quintals in two years time, IPSTA sources said.

Mr. Vijay K. Agarwal, Chairman of Forward Markets Commission, while speaking at the workshop on salient features of the international pepper futures exchange, formally named as India Pepper and Spice Trade Association - International Commodity Exchange (IPSTA-ICE) division - said the decision to set up the exchange was in tune with the Kabra Committee's recommendations in 1994.

Mr. Agarwal said foreign participants were welcome and could trade in the IPSTA-ICE, whereas only Indian participants would continue to trade the domestic pepper futures contract. Foreign participants who wanted to open a branch office in India and become a trading member of IPSTA-ICE as well as Indian participants who wished to trade and/or clear trade on behalf of foreign participants would require permission from RBI under the Foreign Exchange Regulation Act. There will be four category of participants in the IPSTA-ICE - ordinary members with both trading and voting rights, institutional clearing members with only voting rights, associate members with neither trading nor voting rights and registered members with only trading rights but through an ordinary member.

The ordinary members are divided into four categories - composite clearing members, composite trading members, trading members and trading-cum-clearing members. This categorisation is based on the different requirements in regard to capital adequacy norms, payment of admission fee and subscription fee.

Toubro to Make Foray Into Food Processing Sector

Toubro Industries, the Punjab-based company is planning to set up an integrated chicken processing project near Lalru, on the Chandigarh-Ambala National Highway. In the Rs. 50 crore ultra-modern facility, which will have a capacity of 32,000 kgs per day, chicken would be processed under highly hygienic conditions, untouched by hands. The company will import the machinery and equipment along with the technology from the US, Holland and Germany.

Moreover, Toubro also plans to float its own breeding farms where birds would be grown under regulated conditions. To complete the integration process, the company will set up hatchery to supply day-old chicks to its farms along with a hi-tech computerised feed mill.

Rajasthan, the Fourth Major Milk Producer

Milk procurement in Rajasthan has gone up to 5,54,000 litres per day in September 1997 from 3,72,000 litres per day in 1993-94 making it the fourth major milk producing State in the country.

Local liquid milk sale has recorded 60 per cent growth increasing from 1,71,000 litres per day in 1993-94 to 2,74,000 litres per day in 1996-97 and by the end of 1997-98, it is likely to be about 330,000 litres per day.

To raise procurement and farmers', income, it had been ensured that the farmers are paid remunerative market-oriented milk prices and payments were made promptly and regularly.

The payment to milk producers had shown a quantum jump from Rs. 68.76 in 1993-94 to Rs. 144.38 crores in 1996-97, a growth of 110 per cent. Special attention had been paid to increase the supply of balanced cattlefeed to the milk producers to enhance milk production in the State.

During 1993-94, 35,627 metric tonnes cattlefeed was supplied to milk producers, while in 1996-97, the supplies have increased to 59,872 mt, thus registering a growth of 68 per cent.

In the area of breeding also, there had been improvement with the number of societies providing bulls for natural breeding service going up to 563 in 1996-97. Artificial insemination concept had been changed to cluster centres approach, which was more cost effective.

Pesticide Industry to Stop Sale of Basic Technical Compounds

In a move which may seriously hit farmers and affect the forthcoming rabi crop, the entire pesticide industry has stopped selling the basic technical compounds needed to make pesticides.

Pesticide formulators too are planning a price hike of at least seven per cent on all pesticides to meet the eight per cent excise duty levied by the Government.

Some of the big players who have completely halted sales include Bayer, Excel industries, United Phosphorus, Sandoz, Cynamid, Ciba-Geigy, Rallis and Pesticides India, Lupin Agrochemicals, Hoechst, Alchemie Organics, besides a host of smaller companies in the country.

There are more than 50 manufacturers of technical grade compounds in India.

The decision to halt sales was unanimously taken by all the major domestic and multinational pesticide companies because of the 18 per cent excise duty demanded by the Government with retrospective effect for the last six months.

The demand for excise duty would cost the industry at least Rs. 93 crores in taxes, without there being any corresponding gains since formulators, who buy these bulk compounds only collect 8 per cent as excise duty from farmers in retail sales.

As a result of this move, the formulations industry has also been forced to cut down production. Once the existing stock of pesticides is over, farmers may soon find it difficult to buy various formulations in the market.

According to sources, the pesticide industry will not resume sales till the Union finance ministry reviews its notification to collect excise at 18 per cent from bulk chemical producers and eight per cent from formulators.

All indigenous manufacturers, prefer to pile up inventories rather than pay a steep excise duty. Some of the smaller players have even shut down their factories.

The pesticide formulators too are facing a tremendous resource crunch and may soon be forced to raise prices of pesticides by at least seven per cent.

Britannia May Slip to Foreign Hands

The majority stake of Rs. 753 crore Indian confectionery major, Britannia Industries, is set to pass on to foreign hands. Associated Biscuits International (ABIL) of UK, part owned by French confectionery giant, Groupe Danone and Mr Nusli Wadia of Bombay Dyeing, are set to bite off 50 per cent plus stake in the Indian company in collaboration with certain NRIs.

ABIL's proposal to hike its existing stake of 38.71 per cent in Britannia to 45.1 per cent has already been approved by the Foreign Investment Promotion Board (FIPB). In addition to this, the ABIL has declared that a group of NRIs "friends and associates of ABIL" hold 5.1 per cent equity of Britannia, thus placing an effective 50.2 per cent stake at the disposal of ABIL. After that, ABIL is expected to assume a tighter management control over the Indian company and introduce new brands and products.

In order to raise its stake, the UK major will be buying Britannia shares from the other shareholders of the company, comprising FIs and the public. ABIL has told the FIPB that there will be no fresh issue of equity for the purpose.

ABIL will have to purchase 12 lakh shares to hike its stake. Till date, Britannia has issued 1.85 crore equity shares, of which 43.71 per cent are held by foreign investors (ABIL and NRIs) and the balance is held by financial institutions and retail investors. The take over, it is learnt, is being managed by Lazard Creditcapital and estimates of the required investment are being worked out by the finance firm. Going by the prevailing market price of the Britannia scrip (Rs. 425), ABIL would have to shell out a minimum of Rs. 50 crores to get control of Britannia.

Industry ministry sources say that SEBI and RBI have communicated to FIPB that the increase in stake would be subject to the prevailing provisions of the takeover code. They have said that purely from an investment point of view, they have no objection. Still, if the takeover code is triggered, ABIL will have to make an open offer to the public.

ABIL is a holding company for Groupe Danone of France which is a world leader in food products and owns several leading brands internationally.

According to Groupe Danone sources, ABIL has proposed to acquire majority control in Britannia to achieve a more active role in the company's management. The French major feels that the brand value of its products to be very high and consequently, wishes to acquire a high level of control in the company before introducing these brands.

On its own steam, Britannia has become the ninth most popular brand in India. It has recently expanded operations by launching dairy and milk related products with its strategy being aimed at transforming itself from just a bakery company. Britannia plans to launch as many as 14 new brands in the domestic market. The new launches are projected to give a turnover of Rs. 2000 crores by the year 2000 from Rs. 752 crores in 96-97.

PepsiCo International to Hike Investment in India

Soft Drink major PepsiCo International has been allowed to increase its investment in its Indian venture Pepsico India to $405 millions from the existing $255 millions.

The Cabinet Committee on Economic Affairs cleared the company's application for the increase in its equity subject to certain conditions which will bring Pepsico India Ltd on the same footing as of Coca-Cola South Asia Holdings. Coca-Cola had been lobbying hard with the Government to ensure that such conditions as being imposed on them are applied to Pepsi also.

According to the conditions imposed on PepsiCo India Ltd, the company will have to be directly engaged in the manufacturing, marketing and distribution of beverages in the States of Kerala, Tamil Nadu, Karnataka, West Bengal, Gujarat, Pondicherry, Maharashtra, UP, Andaman and Nicobar Islands, Dadra and Nagar Haveli, Daman and Diu and Lakshwadeep. If the company sets up 100 per cent downstream subsidiaries in these areas in future, they will dilute the equity from 100 per cent to 51 per cent in such a company within five years. This condition is being followed by Coca-Cola- India at present.

At present, franchise bottlers of PepsiCo carry out beverage manufacturing, marketing and distribution operations in the States of Andhra Pradesh, Goa, Madhya Pradesh, Orissa, Bihar, Rajasthan, Delhi, Haryana, Punjab, Chandigarh, Himachal Pradesh, Jammu and Kashmir, Arunachal Pradesh, Assam, Sikkim, Nagaland, Meghalaya, Manipur, Tripura and Mizoram.

In these areas the company shall operate through its Indian franchisee bottlers and will not engage in any direct bottling activity.

Murugappa Group's Joint Venture with Biotim-Belgium

Polutech (Madras) Pvt. Ltd. a part of the Chennai-based Murugappa group, has been converted into a joint venture with Biotim S.A. of Belgium, which once supplied a biogas recovery plant to another group company, EID Parry.

'It will be an equal partnership, with both parties equally owning the Rs. 2-crore share capital.' Mr. M. A. Alagappan, Chief Operating Officer (COO) of the Murugappa group, told media persons. While Biotim would supply the technology, the joint venture would be managed by the Indian side.

The joint venture company, to be named Biotim-Polutech Ltd, will concentrate on promotion of business in all kinds of water management from process design and detailed design to execution of turnkey projects at customer sites. It would essentially manufacture effluent treatment equipment.

Biotim is a part of the Fabricom group of Belgium, one of the leading players in environmental engineering. About a decade back, the company supplied EID Parry a biogas recovery plant.

Dr. Rajamani of Polutech said that the market for waste water treatment equipment could be as high as Rs. 200 crores.

If related equipment like pipes were included, the market could be bigger, he added.

Polutech (Madras) Pvt. Ltd was formed after the closure of the Polutech division of Coromandel Engineering Company.

It has supplied equipment for the effluent treatment systems of more than 500 customers so far.

Honey Processing Plant to be Set up in Pune

A honey processing-cum-moisture reduction unit had been designed, fabricated and tested at the Central Bee Research and Training Institute, (CBRTI) Pune. The unit, first of its kind in the world, had processing capacity of one lakh kg per year.

The institute has also developed and fabricated honey processing plants of medium (50,000 kg per year) and small (20,000 kg per year) capacities. Reduction of three to five per cent has been achieved by the unit and by controlling the rate of honey flow and temperature in the heat exchangers, higher moisture reduction of seven per cent could also be achieved.

The honey processing-cum-moisture reduction unit has a falling film evaporator, condensor,

condensate collector and a vacuum pump.

Raw honey after being pre-heated at 40-45^{0}C is filtered through 80 micro metre polypropylene micro filter under pressure using positive displacement type metering pump. The pre-heated and filtered honey is then passed through heat exchanger and heated to 60 to 65^{0}C to destroy honey fermenting yeast cells.

The processed honey is then taken to the feeding tank and passed through heat exchanger having falling film tubes to expose thin film of honey for evaporation of moisture at 60^{0}C. The use of falling film evaporator under vacuum facilitated removal of water at relatively low temperatures.

The water vapour produced in this process was immediately removed out of the surrounding atmosphere facilitating further evaporation and reabsorption of water into the honey.

Having treated at low temperature, enzyme content and other natural volatile ingredients were retained and quality of honey was also not impaired.

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Anticarcinogenic Attributes of Dairy Products

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Introduction

Cancer has been a disease of serious concern for the last three decades. Almost all animals and birds including human beings are susceptible to cancer. Cancer of the gastrointestinal tract, oral cavity and breast are more common in Indian sub-continent. It can invade and affect each and every organ and parts of human body. As our environment is getting polluted day by day with increasing exposure to mutagens, teratogens and carcinogens, the risk of cancer is multiplying in a logarithimic rate. Much research on cancer, its aetiology, pathogenesis, detection, treatment, prophylaxis and cancer immunology as well as molecular biology is going on all over the world and it has contributed a lot regarding cancer biology. However, the treatment and preventive measures developed till today are far from the reach of poor people. The cancer treatment programme is too costly and not affordable for the less effluent people of the society. In this context, looking at the anticarcinogenic properties of milk and milk products seems to be quite interesting. This article deals with anticarcinogenic attributes of milk and milk products and their constituents with special reference to conjugated linoleic acid, antitumour glycopeptides of certain lactic acid bacteria and anticarcinogenic properties of fermented milks.

Conjugated Linoleic Acid (CLA)

Conjugated linoleic acid (CLA) is a mixture of positional and geometric isomers of linoleic acid containing conjugated unsaturation. The cis-9, trans-11-octadecadienoic acid isomer is produced in ruminant animals as a first intermediate in the biohydrogenation of dietary linoleic acid by a linoleic acid isomerase from the rumen bacteria *Butyrivibrio fibrisolvens*. CLA is reported to have anticarcinogenic properties.

As our environment is getting polluted day by day with increasing exposure to mutagens, teratogens and carcinogens, the risk of cancer is multiplying in a logarithimic rate.

Dietary Sources of CLA

Milk products are the richest dietary sources of CLA, depending upon the pasture conditions. Milk fat may contain upto 30 mg CLA/g fat, predominantly the biologically active cis-9, trans-11 isomer. In general, fat from meat of ruminant animals contains more CLA than that from non-ruminants. They obtain their CLA by dietary means and some bacterial isomerism of linoleic acid. Vegetable oils and margarines, on the other hand, contain only small amounts of CLA. It is also present in the tissues and body fluids of humans and the blood serum levels can be increased by diets rich in CLA. High levels of CLA have been found in dairy products like milk, butter, cheese and yoghurt. Cheeses that were aged or ripened for greater than 10 months had the lowest CLA content (Chin *et al.*, 1992) and milk fat contains small amounts (0.5-0.6%) of CLA. However, according to Ha *et al.* (1989), CLA content in dairy product varies from 28.3 ppm (Raw Milk) to 1815 ppm (Ramano and Colby cheese). Natural microbial fermentation during *dahi* (curd) formation increases the CLA contents to 1.0 and 0.9%, respectively, when made from cow and bufallo milk. Traditional methods of manufacture of ghee (anhydrous

milk fat) by curd preparation, heating and clarification of cow's/buffaloe's fat increase the CLA content to 2.5- 2.8%. The CLA contents of ghee made out of such fat, significantly increases further at clarifying temperature of 120^{0}C by the indigenous method (Aneja and Murthi, 1990, 1991). Hydrogen donors (BHT, propyl gallate, cysteine, ascorbic acid) and dairy additives (sodium caseinate, sweet whey powder and non-fat dry milk) are capable of increasing the CLA content of processed cheese. Among these, propyl gallate is the most effective CLA enhancer in processed cheese. Lipid oxidation systems such as Fe^{-2} and Fe^{-3}/ascorbate were also effective in increasing the CLA content of processed cheese (Shantha and Decker, 1993). Table 1 indicates levels of CLA in different foods of animal and plant origins. Although CLA as such has a strong anticarcinogenic potential, there is no evidence that conjugated linoleic acid has any anticarcinogenic action, when administered orally with a large amount of saturated milk fat i.e. ghee (Sarkar, 1991).

Mechanism of Anticarcinogenesis by CLA

Conjugated linoleic acid has been shown to inhibit initiation of mouse skin carcinogenesis and is cytotoxic to human malignant melanoma, colorectal and breast cancer cell lines *in vitro* (Parodi, 1994). Although the exact mechanism by which CLA exerts its anticarcinogenic activity, is still not clear, it modulates the activity of cytochrome P450 and reduces the induction of ornithine decarboxylase and protein kinase

Table 1. Dietary Sources of CLA

Dietary sources	Concentration of CLA
Dairy Foods	
Raw whole milk	0.028 mg/g whole milk
Milk fat	2 -.30 mg/g fat
Cow ghee	6 - 21 mg/g ghee (Variation due to extraction process)
Buffalo ghee	5-19 mg/g ghee (Variation due to extraction process)
Non-fat frozen dairy dessert	6.0 mg/g fat
Condensed milk	7.0 mg/g fat
Processed cheese	3.2-8.9 mg/g fat
Romano cheese	2.9 mg/g fat
Colby cheese	6.1 mg/g fat
Whiz cheese	1.8 mg/g cheese
Brick cheese	7.1 mg/g fat
Blue cheese	0.6mg/g fat
Permesan cheese	1.9 mg/g fat
Meat and Meat Products	
Lamb and other small ruminant's meat	4.0-5.6 mg/g fat
Beef	3.7 mg/g fat
Veel	2.7 mg/g fat
Pork	0.6 mg/g fat
Chicken	0.9 mg/g fat
Turkey	2.5 mg/g fat
Grilled ground beef	0.9 mg/g fat
Other Sources	
Seafoods	0.3-0.6 mg/g fat
Plant and vegetable oils	0.1-0.7 mg/g fat
Eggs	0.6 mg/g fat
Corn, olive, coconut oil	0.2 mg/g fat

C, the known tumour production indicators and possibly also inhibits protein and nucleotide biosysnthesis (Parodi, 1994). Antioxidant effect of CLA may be of considerable significance in protecting cell membranes from damage caused by oxidation-induced free radical, thereby exhibiting anticarcinogenic effect (Chin *et al.*, 1993). According to Pariza (1991), CLA is incorporated into cell membrane phospholipid, where it acts as an antioxidant, affecting the metabolic activation of some carcinogens by cytochrome P450 enzyme and reducing induction of ornithine decarboxylase by TPA (a model tumour promoter).

Recently, many research workers are trying to synthesize CLA on large scale from linoleic acid in hydrolysed safflower oil, using isomerase from *Butyrivibrio fibrisolvens*(a strictly anaerobic bacteria of ruminal origin). CLA is supposed to be used as an antioxidant in foods or mould inhibitors in cheeses.

Cultured Milk Products

Fermented milk products, supplemented with *Lactobacillus acidophilus* and *Bifidobacterium bifidum* have long been reported to have anticarcinogenic properties. Lactobacilli can have an influence on cancer formation in intestinal tract (Goldin and Gorbach, 1984). Later, Takano *et al.* (1985) proved the same by feeding "sour" milk to rats. Sour milk is generally prepared by fermenting milk with a mixture of *Lactobacillus helveticus* and *Candida utilis*. *In vitro* studies have revealed that Lactobacilli and other lactic acid bacteria have the ability to absorb cooked food mutagens. Recent studies in man have shown that intake of *L. acidophilus* significantly reduced the mutagen excretion after consumption of fried meat and hence, certain strains of Lactobacillus might lower the risk of colon cancer in man (Ladbeek *et al.*, 1992).

Mechanism of Anti-tumour Activity

Gilliland (1989) provided a strong evidence supporting the fact that the lactobacilli can suppress tumour development in gastrointestine. *Lactobacillus acidophilus* can reduce the level of activity of b-glucuronidase, azo - reductase and nitro- reductase, which are common enzymes present in the faeces of humans and have the ability to convert procarcinogen into carcinogen in humans, thereby reducing the chance of occurrence of cancer in G.I. tract (Goldin and Gorbach, 1984a). Macrophages are reported to play a vital role in supressing the growth of tumour cells. Consumption of fermented milk containing viable cells of *Lactobacillus casei* activates macrophages in mice in terms of increased lactic dehydrogenase (LDH) activity and hence dietary lactic cultures may supress tumour proliferation (Perdigon *et al.*, 1986).

Fermented milk products, supplemented with *Lactobacillus acidophilus* and *Bifidobacterium bifidum* have long been reported to have anticarcinogenic properties.

Anti-tumourigenic Glycopeptides of LAB

Bogdanov *et al.* (1962), were perhaps the first to report that *L. bulgaricus* possessed a potent anti-tumour activity. Later, they isolated three glycopeptides, which possessed potential biological activity against sarcoma 180 (Bogdanov *et al.*, 1975). *Lactobacillus helveticus* var. jugurti also contains an anti-tumour polysaccharide, having antitumour activity against ascites sarcoma-180 (Oda *et al.*, 1983). *L. bulgaricus* appears to be more inhibitory than *Streptococcus thermophilus* and culture cells killed by heat lose their tumour inhibitory activity. In colaboration with Sloan-Kettering Institute for Cancer Research, Shahani and Chandan (1979) tested several Lactobacilli against Sarcoma 180 and reported that *L.acidophilus* DDS-1 possessed definite antitumour activity. They further continued their research with tissue culture system as well as Ehrlich ascites tumour cells and with Hi Line and KB Line tissue culture system and reported that several extracts of yoghurt and *L.acidophilus* possessed anti-tumour activity. A linear relationship between the level of intraperitoneal implantation of Lactobacilli from cultured milks and Ehrlich ascites tumour (EAT) cell supression exists in mice (Fernandes *et al.*, 1990), However, such phenomenon is yet to be established in humans.

Anticarcinogenic Properties of Yoghurt

Yoghurt, a fermented dairy product is supposed to possess maximum therapeutic properties.

Experimentally, it has been proved that feeding yoghurt dialysate to mice significantly inhibits tumour growth and proliferation. Colostrum fermented with *L. acidophilus, L. bulgaricus,* or yoghurt culture

significantly inhibit tumour cell proliferation showing 16-40% decrease in tumour cell counts (Shahani *et al.*, 1983). Intravenous administration of aqueous but petroleum ether-insoluble fraction from yoghurt causes 25-35% reduction of tumour cell growth in mice. Antitumour activity of yoghurt appears to be localised to solid fraction, as the supernatant fluid (after centrifugation) has no anti-tumour activity (Reddy *et al.*, 1983) However, the acidic fraction of the dialysate of yoghurt does contain anti-tumour activity (Ayebo, 1980).

Bifidobacterium is one of the beneficial dairy microorganisms, well known for its probiotic attributes and production of "Bifidus factor". It is a natural inhabitant of gastrointestinal tract of breast-fed infants and are recently being used in infant formulations. According to a recent study, *Bifidobacteria* remove the sources of procarcinogens or enzymes that led to their formation(Hughes and Hoovers,1991), thereby reducing the risk of cancer of G.I. tract. Hawkins (1993) observed that fewer tumour cells developed, when *Bifidobacterium longum* was present in the intestinal flora.

However, milk products containing *L. acidophilus* have the potential for preventing or controlling intestinal infections, improving lactose digestion in people classfied as lactose intolerant, helping control serum cholesterol levels and exerting anti-carcinogenic activity. Recent study conducted on*L. acidophilus* has shown that a single strain of the organism probably will not produce all these benefits at optimal levels. Careful selection of specific strains of *L. acidophilus* combined with proper production and handling procedures will be nessesary to combat carcinogenesis in humans (Gilliland, 1989).

Conclusion

From the foregoing account, it is clear that milk and milk products especially fermented products do possess anticarcinogenic properties. However, at this stage, fermented milk products can not be exclusively relied upon for supression or prevention of any type of cancer. Notwithstanding this, it is a proven fact that continuous intake of fermented milk products containing lactic acid bacteria particularly *Lactobacillus sp.* will certainly reduce the risk of cancer of the gastrointestinal tract.

Yoghurt, a fermented dairy product is supposed to possess maximum therapeutic properties.

***Bifidobacterium* is one of the beneficial dairy microorganisms, well known for its probiotic attributes and production of "Bifidus factor".**

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Challenges in the Packaging of Dairy By-products

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Introduction

A dairy by-product may be defined as a product of commercial value produced during the manufacture of a main product. However, there always exists a possibility that what is now considered as a by-product may become the main product in near/far future. Some important by-products in Indian dairy industry are skim milk, buttermilk, (lassi),. whey and ghee residue produced during the course of manufacturing of various "main products" viz., cream, butter, *chhana /paneer* /cheese/casein and ghee respectively. When an attempt was made to account for the solids of milk, it was found that on an average 98 per cent milk fat, 61 per cent proteins and 54 per cent lactose recovered in various dairy products and the rest was lost in by-products (Webb and Whitter, 1970). As dairy by-products contain 5 to 10 per cent degradable total solids, increase in Biological Oxygen Demand (BOD) is caused to a great extent, if disposed directly in the sewage disposal system of a dairy plant. Because of their unique and great nutritional values coupled with the environmental concerns, it was realised decades back that economic disposal of by-products is an essential pre-requisite for profitable dairying. In India, due to successful implementation of Operation Flood Programmes, which led to enormous increase in overall production and processing of milk, and later on as a result of economic liberalisation, a number of plants have come up to utilise by-products (specially whey) to manufacture a number of products, e.g., lactose, casein and whey protein concentrate (WPC) etc.

Packaging is one of the most important steps in the manufacturing of any kind of food product. It constitutes the vital link between the manufacturer and consumer for the safe delivery of product through the various stages of storage, transportation and marketing. All the precautions and care taken to produce high-grade dairy products go in vain, unless they are delivered in a fresh, sound and convenient form to the consumer. Here lies the importance of packaging in that the loss can be minimised to a great extent by adequate protective packaging to withstand the hazards of storage, transportation, handling and environmental influences.

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Specific Packaging for Dairy By-products

Various packaging materials used for packaging of foods such as dairy products etc., include paper and paper-based products (vegetable parchment paper, wax or plastic - coated paper, grease proof paper, glassine paper, paper boards, etc.), glass (transparent or opaque), tin-plate, aluminium foil, plastics (cellophane, treated cellulose, saran, LDPE, PVC, PVDC, pliofilm, nylon etc.), laminates (paper polyethylene, cellophane-polyethylene, paper- aluminium foil-polyethylene etc.) , timber etc. These materials used in the form of cartons, bottles, can barrels, sachet/bag pouches, boxes/tubs, cups, collapsible tube etc.

Packaging is essential for the safe and easy marketing of dairy by-products and for the retention of their natural characteristics till consumed or utilised otherwise. The factors taken into consideration for selection of packaging material for a particular food products usually are:

* It must protect and preserve the commodity from the time it is packed to the point of consumption.

* It must be compatible for the chosen selling and distribution system.

* It must be attractive to the consumer, easy-to-open, store and dispose.

* It must not cost more than the market can sustain.

Some of the by-products may have particular properties (e.g. lactose and whey powder are very hygroscopic) unique to that product. So, selection of packaging material for dairy by- products is very vital in determining the effectiveness of packaging and so great care should be taken to select the material suited for the special requirements of the product. These aspects are dealt with in this article.

Skim Milk and Its Products

The various products made from skim milk are : market skim milk (plain, flavoured, cultured), plain or sweetened condensed skim milk, skim milk cheeses, like cottage and quarg, casein and co-precipitates and skim milk powder.

Market Skim Milk (Plain, Flavoured and Cultured)

As its composition is same as that of whole milk except for the fat content, the packaging material used for skim milk is almost same as that of whole milk. The allowance that can be made for skim milk packaging is that the material need not be highly grease resistant. On the other hand, it should be absolutely leak- and tamper-proof, should have sufficient wet strength and should not leave any odour behind. Accordingly, skim milk can be packed in glass bottles, cans, plastic pouches, paper boards etc. Packaging of skim milk (plain or flavoured) started in glass bottles. After 1933, waxed paper followed by various plastics were used. A survey conducted in USA (Anon., 1985a) where skim milk was preferred to milk containing fat by majority of the people showed that the use of paper board cartons for fluid milk packaging had decreased from 71 to 39 per cent, while use of blow moulded HDPE was on the rise from 25 to 60 per cent. The increase in the use of HDPE containers was attributed to the fact that they were light in weight, they had handle for holding and pouring, they were leak and shatter-resistant as opposed to glass bottles, and could be closed again and used afterwards also. They can be recycled and they allow more light than paper containers so that the level of the product can be seen.

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Lejuene (1987) reported the use of tetrabrik cartons for packaging skim milk in the French market. Plastic containers with carrying handle (1.5 litre capacity) were also used in France for packaging skim milk (Mayet, 1988).

An important aspect, which should be borne in mind for selection of appropriate packaging material for plain or flavoured skim milk, is that it is more susceptible to riboflavin degradation than whole milk. A study by Palanuk (1988) showed that protective film overwraps reduced or prevented photo oxidation of riboflavin in milk. Polyethylene terephthalate (PET) film of 1 mm thickness coated with aluminium vapours, can be used as protective film for skim milk packaging. Eklund and Breune (1989) reported that aluminium content of skim milk stored in aluminium laminated carton was below the danger limit. So, these types of packages can be safely used for packaging skim milk. Plastic bottles blow moulded at the dairy factory are widely used for packaging skim milk, acidophilus milk and butter milk in USA (Elloiott, 1989).

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The most common cultured or fermented milk manufacured from skim milk are cultured butter milk, Bulgarian cultured milk, acidophilus milk, kefir, yoghurt and skim milk *dahi*. Commonly used packages for fermented milks are glass bottles, plastic/plastic-coatedpapercups, polyethylene bags (Bunnies and Timm, 1983) or cartons. The packaging requirement of fermented milks produced form skim milk is same as that of skim milk itself.

At refrigerated temperature (5^0C) of storage, cultured skim milk or kefir retains organoleptic

qualities better in aluminium-lined cartons than in regular polyethylene (PE) (Castberg *et al.*, 1986). It has been reported (Gjengedal and Oterholm, 1987) that the use of aluminium could increase the shelf life of cultured dairy products. Bifidus milk powder prepared by culturing skim milk with *Bifidobacterium longum* stored best, when sealed in packaging with an aluminium layer (Nagawa and Nakabayashi, 1988).

Aluminium content in cultured skim milk packed in Tetrapak and Elopak, stored at 4^0C for 20 days was satisfactory (Eklund and Breune, 1989). Dried yoghurt made from concentrated skim milk is packed in multilayer paper sacks with sealed PE lines (with net weight of 25 kg) in UK. (Anon 1987).

Plain or Sweetened Condensed Skim Milk

Plain or sweetened condensed skim milk is similar to plain or sweetened condensed milk (SCM) in composition except for the fat content. Plain or sweetened condensed skim milk is packed in tins like SCM with 4 per cent or 9 per cent fat.

A mini-carton made of an aluminium paper compound has been developed to pack condensed skim milk. Condensed skim milk is packed sceptically and the mini-cartons have a shelf-life of up to 12 months at ambient temperature. The advantages of these mini-cartons were claimed to be that they were attractive, practical and economical but, cost around the same as a can (Anon, 1985b).

Skim Milk Cheeses like Cottage and Quarg

Some of the cheeses made from skim milk are cottage cheese, quarg cheese (European origin), baker's cheese (USA), gammelost cheese (Norway) and sapsago cheese (Switzerland). Among them, cottage and quarg are produced in substantial quantities. The specific requirement of these cheeses is that the packaging material should have a low WVTR, as escape of moisture from the cheeses will make their surface very hard, which is undesirable.

The combination of plastic and paper board gave the required characteristics (Anon, 1984). Abrahamsen (1986) reported that cottage cheese can be packed by piston filler in cups. Fast drying glue was applied to the bottom of the cups, which were then placed on a cardboard pad. Shrink wrapping of the product eliminated corrugated boxes. Packaging of cottage cheese in hermetically sealed containers, replacing the headspace by inert gases increased the shelf-life of the product (Lexag, 1978; Akkala, 1985; Bender, 1995). Packaging of cottage cheese in polystyrene tubs, and in ethylene vinyl acetate/PVDC/ethylene vinyl acetate structured laminate has been reported (Tochman *et al.*, 1985). PVC shrink bands are usually applied to tubs of cottage cheese. The bands perform two functions, (i) they decrease the ingress of spoilage organisms and this keeps the product fresh for a longer period and (ii) they are tamper-proof. Rolls of tubular film is cut to the required width and then applied to the tub lids and shrunk slightly using heat to hold it in place (Anon, 1986). Recaldin (1990) has reported that polystyrene is the dominant packaging material for cottage cheese in the European market. But, polypropylene is likely to increase its share in due course.

For industrial use and storage, skim milk powder may be packed in barrels, drums or bags and for retail purposes in plastic bottles, plastic bag or cartons.

Quarg is a product similar to the curd of skim milk. It is usually packaged in modified atmosphere. Recyclable glass and cartons have been successfully introduced for quarg packaging in Germany (Eilertsen, 1985).

Caseins and Co-precipitates

After precipitation, washing and drying, casein is either unground or ground and stored. Casein can absorb moisture and becomes soft and gummy, which leads to the deterioration of the quality of casein. So, the packaging material should have a low WVTR and should be tamper-proof.

Dried casein, either ground or unground is packed in sacks or bags. Burlop sacks lined with closely woven cloth or heavy three-ply paper bags may be used. The filled containers should be tightly closed and transferred to a clean dry storage room maintained at uniform temperatures. If casein has to be stored for a considerable time, it is best to store it unground or else the rodents will be a great nuisance. Mann (1982) reported the use of 300 gauge polyethylene bags for packing and storage of co-precipitates.

Skim Milk Powder (SMP)

Skim milk powder contains minimum 96 per cent milk solids of which around 60 per cent is lactose which exists in amorphous form. As amorphous lactose is hygroscopic, packaging material should have a low WVTR in order to prevent caking. A suitable container for dry milk should also be impervious to light and gases, should be corrosion - resistant and be relatively easy-to-fill, seal, handle and empty and must be re-closable, if necessary.

For industrial use and storage, skim milk powder may be packed in barrels, drums or

bags and for retail purposes in plastic bottles, plastic bag or cartons. A 2 mm polyethylene bag inside a 4-ply kraft paper bag is a common package for domestic commercial trade. Paper and cardboard improved with coatings of wax, plastic materials or resins could also be used. But, these were widely replaced by films like polyethylene, plio-film and PVDC after the growth of plastic industry (Crossley, 1966).

Gunny bags with 2 ply kraft paper and polyethylene lining were used for bulk storage and polyethylene bags for small packages (Kashmiri Lal, 1968). During packaging, care must be taken to make the bag leak-proof. It can be done in two ways (Crossley, 1966): one way is that the powder is enclosed in a separate inner bag of PE, which can be closed by heat sealing or by twisting the top of the bag and securing it with a metal clip or a strong rubber band. Common thickness of polyethylene is 0.04 mm for 25 kg and 0.05 mm for 50 kg bags. The thickness of polyethylene varies from 0.02 to 0.08 mm. Heavy gauge polyethylene is used for long usage. The other way is that the polyethylene liner can be laminated directly to the inner wall of the paper sack. But, this reduces the flexibility of the sack and there is a great risk of imperfect sealing. Heat sealing, if not at the right temperature, leads to loss of impermeability in the area of heat seal. Plastics have been reported to replace glass and some paper boards in SMP packaging (Harte *et al.*, 1984). Kirsimaye (1986) described the use of glass fibre containers for transporting SMP. Herner (1986) observed no change in bacterial counts, when CO_2 was used as a protective gas in SMP packaging.

Punjrath (1995) reported that instead of 25 Kg gussetted multiple layered bags with hand-inserted liner, inserting of pinch bottom bags at the manufacturing stage of bag itself improved strength and provided a complete seal to package. Block-bottom bags with cube shape, when packed, gave improved container utilization and minimised packaging wastes.

Whey Products

Whey is regarded as one of the major by-products of dairy industry produced during manufacture of cheese, *channa, paneer* and casein. It constitutes bulk of environment polluting substances, which can otherwise be utilised properly for manufacturing highly nutritious substances. With the increase in world cheese production, which has touched 14.9 million tonnes in 1995 (IDF, 1995), total quantity of whey increased tremendously as each kg of cheese gives 7 to 8 kg of whey. Whey is mostly processed at the plant, where it is produced. Hence, as such it is stored in refrigerated tanks and seldom packaged for sale. Products obtained from whey include whey powder, whey protein concentrate (WPC), lactose, whey beverages, ricotta cheese etc.

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Whey Powder

Whey powder can be packed in same form of bulk container used for packaging of SMP and there are usually two types: 25 kg multi-wall paper bag with PE liner and 500-1000 kg bulk bin. By far, the greater quantity of powder is packed in multi-wall bags, but there is increased interest in the development of larger packs due to the potential savings in freight and handling costs. The key feature of multi-wall bags is that it is robust, relatively cheap and capable of being kept at high production rates, e.g., 9-10 tonnes/hr being achievable with modern filling-sealing equipments. It is very convenient for major end-use such as recombining plants and repacking stations. Specifications for multi-bags vary from country to country, but a 4-5 ply bag with a minimum 420 g/m^2 basis weight with an inserted LDPE liner of 15 μm is considered to be adequate. Any of the following constructions have been shown to be adequate for export purposes.

4-ply construction

-Outer layer of crepe laminate of 168 g/m^2 basis weight

-3 inner plies of 84 g/m^2 natural kraft paper

-1 inserted liner of 80-90 um LDPE

5-ply construction

-One outer layer of 70 g/m^2

-1 inner layer of 70 g/m^2 polythene

-3 inner layers of kraft of 70 g/m^2

Odour and taste of whey powder are affected more than colour or consistency during storage. Jayaprakash (1992) observed that these changes were more in samples stored in PE/paper laminate, which was more permeable to oxygen and vapour and this might be the reason of deterioration. He concluded that whey powder should be packed in materials having low OTR and WVTR.

Whey Protein Concentrates (WPC)

Dried WPC can be packed in the same way as SMP, i.e., the packaging material should be moisture-proof because WPC contains some amount of lactose, which may lump, if it comes in contact with moisture vapours

and some protein-lactose interaction may also take place. WPC is a new product which has only industrial applications. So far, literature on the packaging of WPC is very scanty.

Lactose

Dried lactose powder is non-hygroscopic, if all the lactose is in crystalline form. It has no special requirement as such and so can be packed in bags used for SMP. As lactose is mostly used for industrial purposes, it is generally packed in bulk packages, i.e., kraft paper bags with polyethylene lining.

Whey Beverages and Drinks

Some of these types of products are manufactured by mixing appropriate fruit juice concentrates with processed whey. Other types include fermented whey beverages, both alcoholic and non- alcoholic (acidic), carbonated thirst quenching beverages and whey-based flavoured milk drinks. Whey drinks are very popular in western countries and most of the non-carbonated beverages are sold in tetra-brick or gable top paper board containers. Plastic cups with aluminium foil seals are also used, though it is not a very convenient pack for the customer unlike for the manufacturer. Metal cans, glass or rigid plastic bottles have been seldom used. In the western countries, whey beverages are readily available on vending machines and therefore, small paper containers or PVC glasses are being used satisfactorily. Carbonated whey drinks are usually sold in aluminium flip-top cans like that of Coca-Cola or Pepsi. They are also available in glass bottles with crown-corks just like other carbonated soft drinks (Zadow, 1992).

Whey Cheeses

Various cheeses made from cheese or casein whey include, ricotta, mysost, gjetost, primost etc. These cheeses, particularly ricotta principally contains whey proteins, some fat and very high moisture content. The packaging material should have low WVTR and low OTR to prevent moisture loss and fat content. The highly soft nature of the product makes it unsuitable for vacuum-packaging (Anon. 1986a). Modified Atmosphere Packaging (MAP) may be very successful because of the 'cushioning' effect of the gas. Gas flushing with CO_2/N_2 mixture has been successful in prolonging the shelf-life of ricotta cheese (Addington, 1991). Besides, PVC packages have been reported (Dender *et al.*, 1986) to be successfully used for whey cheeses. Abrahmsen (1986) recommended hot filling of Norwegian brown goat whey cheeses in aluminium foil or plastic bags at 75-90^{0}C. Cheese had to be temporarily supported by rectangular aluminium foil or plastic boxes because of the soft nature of the cheese.

As lactose is mostly used for industrial purposes, it is generally packed in bulk packages, i.e., kraft paper bags with polyethylene lining.

In the western countries, whey beverages are readily available on vending machines and in this case, small paper containers or PVC glasses are being used satisfactorily.

Shukla and Brar (1986) have reported that plastic, parchment paper, polyethylene and wax coated papers may be used for packaging of ricotta cheese. They found that wax - coated paper cheeks the hardening of outer surfaces more satisfactorily on storage as compared to polyethylene.

Buttermilk and Its By-products

Buttermilk and skim milk have (except butter milk being slightly thinner and contained slightly more fat), many criteria in common for practical and economic reasons, the packaging material used for skim milk may be used for packaging buttermilk. Though there are a lot of products that can be made from buttermilk, only few of them are economically viable and produced in substantial quantities in dairying in advanced countries. Important amongst them are dried buttermilk, casein and beverages.

Dried Buttermilk

This product is hygroscopic and so the packaging material should be air-tight and totally moisture - proof. The composition of this product is almost similar to SMP and so the packaging materials used are generally the same as those for SMP.

Beverages

The beverages manufactured from buttermilk are almost similar to whey drinks except the fact that they have high acidity. Hence, the packages used for buttermilk based beverages are almost same as those for whey.

Ghee Residue and Its Products

Ghee residue contains fat,

denatured protein, burnt lactose and minerals and considered as highly nutritious. The main defect during the storage of ghee residue is related to the development of tallowiness. If prolonged storage is required, removal of fat by boiling in hot water followed by boiling in 10 per cent sodium bicarbonate solution has been recommended (De, 1980). As ghee residue is hardly marketed in a packed form, literature concerning this is scanty. In a study on shelf-life evaluation of ghee residue,

The proper packaging of dairy by-products is utmost important not only to preserve edible or industrial quality, protecting nutritive value and savings from wastage but also for competitive marketing and achieving better returns.

Subbulakshmi *et al.*, (1990) observed that ghee residue samples packed in plastic, glass and tin containers showed no significant changes in free fatty acid content, peroxide value and tintometer reading after 90 days of storage. The keeping quality was better in glass and tin containers than with plastic ones.

Conclusion

The proper packaging of dairy by-products is utmost important not only to preserve edible or industrial quality, protecting nutritive value and savings from wastage but also for competitive marketing and achieving better returns. Lot of progress has taken place in packaging industry in India. Now-a-days numerous types of packaging materials are available with a wide range of barrier properties. Some of them can be adopted for packaging by-products, but proper selection must be made with respect to composition of the product, storage condition, time gap between production and consumption, any legal requirement and end use of the product.

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New Milk Foods for the Emerging Market

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India is one of the largest milk producers in the world with an output of about 70 million tonnes per annum valued at about 60,000 crores (Table 1). In 1994 - 95, the percapita consumption of milk is about 193 g (Fig. 1). Internationally, New Zealand is the nearest competitor for the purchase of milk as a raw material (Fig. 2). About 13% of the milk produced in the country is being processed by the organised dairy industry producing a range of dairy products like varieties of milks, baby foods, butter, ghee, condensed and dried milks, *pedha, paneer,* ice - cream and other dairy products. The value output of the organised dairy industry could be estimated at about Rs 15,000 crores out of which about 90% is contributed by the co - operative sector.

Private Dairy Industry

The delicensing of the dairy industry in 1991, opened up this sector for the entry of private sector into the milk processing business. Since then, there is a rapid increase in the creation of infrastructure for milk processing and today facilities have been created for processing of about 100 million litres of milk per day and the capacity utilisation is estimated at around 30%. There are about 36 dairy companies listed on different stock exchanges of the country and during the year'94 - '95, about 17 dairy companies have raised about Rs 500 crores from the public for newer dairy projects.

Table 1. Milk Production in India Over the Last Decade

Year	million tonnes
1988 - 89	48.2
1989 - 90	50.7
1990 - 91	53.7
1991 - 92	56.4
1992 - 93	58.7
1993 - 94	60.6
1994 - 95	63.3
1995 - 96	66.3
1996 - 97	67.8
1997 - 98	70.7

Future Investment

Every increase in the processing of milk by 1% is likely to contribute about Rs 1200 crores in terms of value of dairy products and this type of processing requires about Rs 150 crores of investment to create additional processing facility. Even if the per cent of milk processed remains stagnant, the increase in milk production (about 3.5% annually) calls for an additional investment of about Rs 60 crores on plant and machinery.

Product Profile

Most of the dairy plants in government, co - operative and private sector produce almost similar dairy products like varieties of milk, butter, ghee, skimmed milk powder and whole milk powder. There are about seven large scale cheese manufacturers in the country and about 14 manufacturers producing, infant foods and malted milks. There is immense scope for the broadening of the products' range and some of the products, which

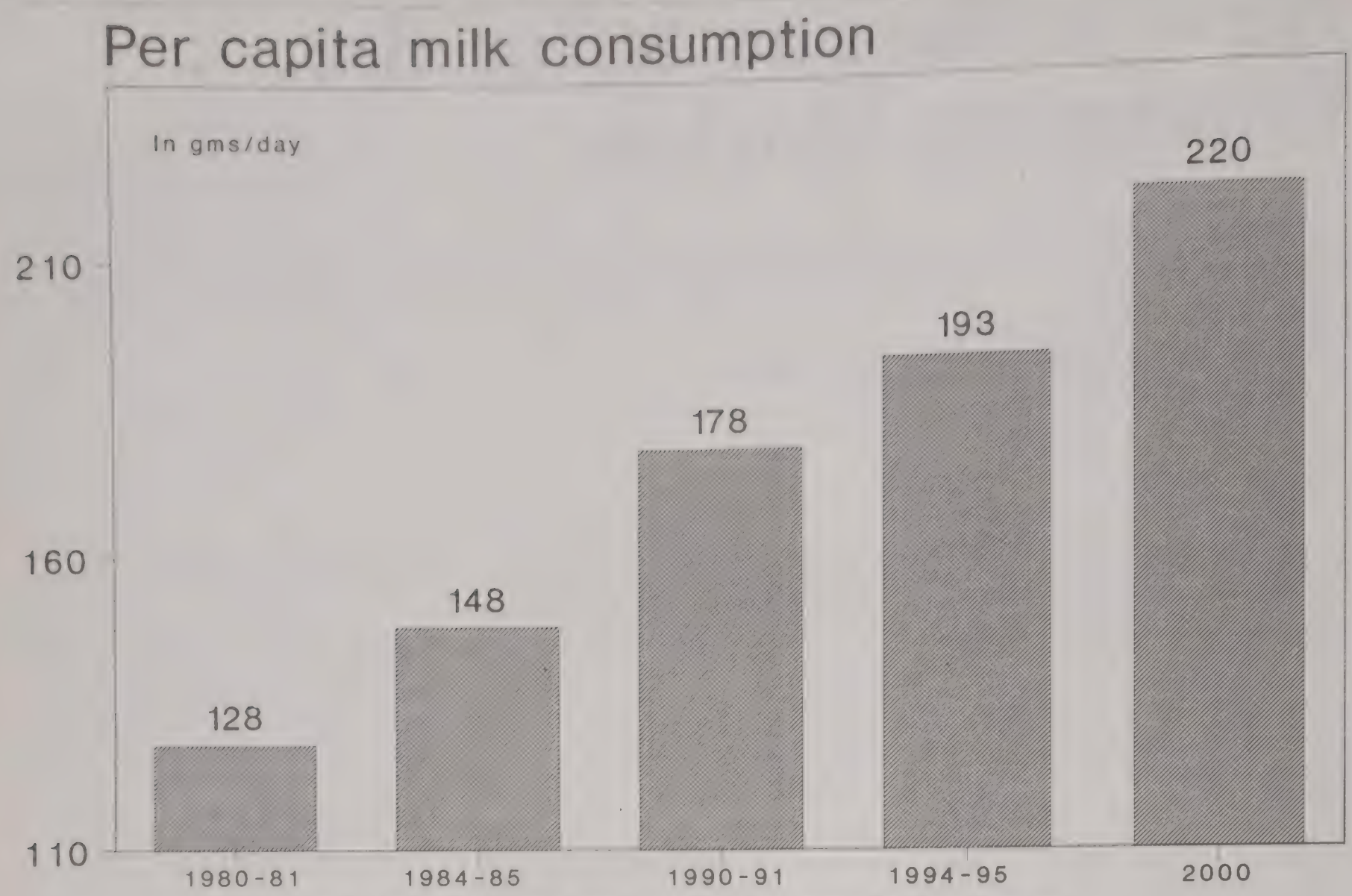

Fig.1 Per Capita milk consumption in India over last two decades

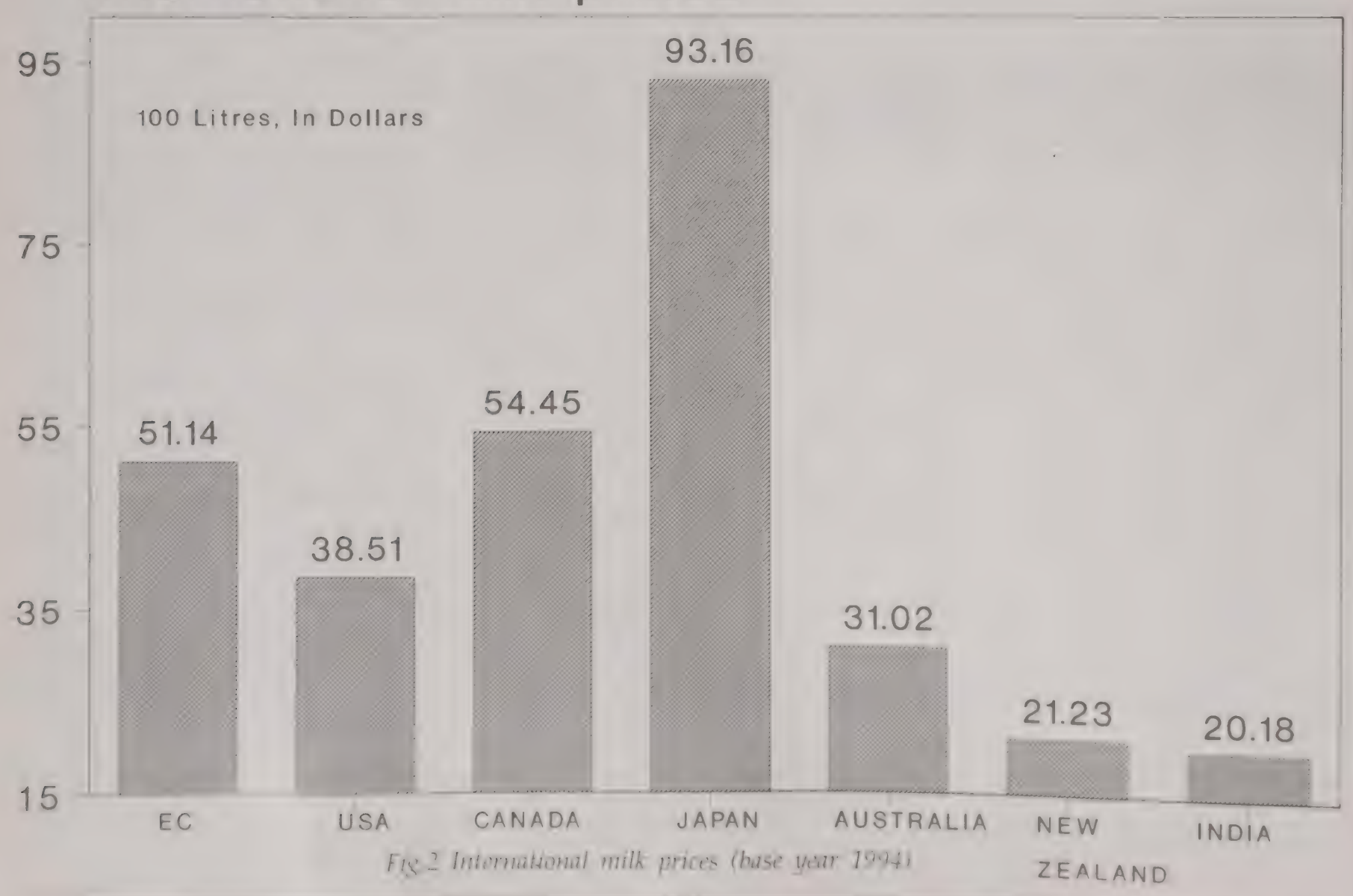

Fig.2 International milk prices (base year 1994)

are likely to have considerable demand in the coming decade, have been identified.

Cheese and Fermented Milk Products

The cheese market, presently valued at about Rs 80 crores is growing at about 9% annually. There are more than thousand varieties of cheeses which have been listed out of which cheddar, mozzarella, gouda and processed cheeses are being manufactured in India. The Italin variety - Mozzarella cheese (Fig 3), used in the preparation of pizzas is becoming popular and presently commands about 5% share of the cheese market. As the market expands, it is likely that there will be increased demand for the specialised varieties of cheeses. Amongst the specialised varieties of cheeses which are likely to have demand under Indian conditions are the Gouda, Provolone (Fig. 4), Parmesan, Colttage, Swiss and Romano varieties of cheeses.

Another area of promise is the fermented milk products. *Dahi* eventhough is Rs 15000 crore market, the share of the organised sector is only around 10%. This product has immense potential for growth and can be combined with the production of similar high value products like yoghurt in various forms like, drinking yoghurt, stirred yoghurt, fruit yoghurt, plain yoghurt, dietetic yoghurt etc. The production of drinking yoghurt with proper sensory quality can be an excellent beverage during the summer months. Yoghurt blended with fruit pulps can also be produced in various forms.

There are about 36 dairy companies listed on different stock exchanges of the country and during the year'94 - '95, about 17 dairy companies have raised about Rs 500 crores from the public for newer dairy projects.

Fruit - Milk Based Products

There are abundant opportunities for the production of varieties of milk shakes wherein milk and fruit pulp can be mixed in different proportions to produce varieties of beverages. This type of product will also be nutritionally superior due to the combination of two of the natural products. Some of the milk and fruit - based beverages, which are likely to have demand are combinations of Milk with mango, banana, sapota, strawberry, papaya etc. Some of these beverages can also be produced in dehydrated form (for example banana milk shake powder - Fig. 5 & Table 2) and can be excellent health foods. The production of these type of products can result in excellent value - added products for the spray drying plants of the country, which are being used to the tune of 40% of the capacity only today.

Table 2. Physico - chemical Characteristics of Newly Developed Products

	Banana Milk Shake Powder	Channa Podo
Moisture	2.6%	30 - 33%
Fat on DM	6.95%	21 - 23%
Protein on DM	14.08%	15 - 17%
Ash on DM	3.15%	0.8 - 21%
Carbohydrate on DM	75.86%	-
Acidity (% lactic)	1.05%	-
Bulk density (g/ml)	0.44	-
Flowability :	Good	-
Sugar		18 - 21%
Starch		6 - 8%
Colour & Appearance :	Dull white	Light brown & crust
Body & Texture :		Spongy texture & soft firm body
Flavour :	Pronounced	Sweet rich fat taste & nutty flavour

Buffalo milk
↓
Standardisation
(3 - 4% fat)
↓
Pasteurisation
(63^0C/30 min)
↓
Cooling
(32 - 35^0C)
↓
Addition of starter
(*S.thermophilus* and *L. bulgaricus*
in the ratio of 1:1; 0.5 - 2.0%)
↓
Ripening
(80 - 90 min)
↓
Renneting
(0.8 - 2.5 g/100 lit of milk)
↓
Cutting
↓
Cooking
(40 - 41^0C in 40 - 50 min)
↓
1/3 whey drained off
↓
Dipping
(0.4 - 0.42% acidity)
↓
Addition of hot water
(80 - 83^0C)
↓
Kneading and stretching
↓
Moulding
↓
Cooling
(8 - 10^0C)
↓
Brining
(15 - 20% at 8 - 10^0C)
↓
Surface Drying
↓
Packaging
(polyethylene or laminated pouches, preferably under vacuum)

Fig. 3. Flow diagram for the manufacture of Mozzarella cheese

The production of value - added products will further reduce the break - even levels of these dairy plants.

Low Fat Milks

In the world market, the consumers can buy milk with any level of fat. In many of the countries, there is no legal ban on the sale of milk with different levels of fat content except that the level should clearly be mentioned on the package. However, these types of milk eventhough are in demand, are not available in India and this has good market potential. Varieties of milks such as skimmed milk (commercially not - fat - milk), low fat milk with 1.0 - 1.5% fat, high protein milks if introduced, are likely to have demand in the market.

Some of the newer processes which can be adopted for the production of varieties of newer milk - based products are the membrane processing, UHT processing, high pressure treatment, hurdle technology and bactofugation process.

Indigenous Milk - based Sweets

There are varieties of traditional milk - based sweets manufactured in the country. The market size of the milk - based sweets is estimated at around Rs 12,000 crores. However, there is no nationally known brand in this category. Many of the organised

dairies in co -operative sector are involved in the manufacture of varieties of milk - based sweets like *Pedha, Burfi, Mishti Doi, Shrikhand* etc. However, the sale of these products is restricted to particular region and in this direction, there is scope for taking these high value - added products to national level by adopting improvised methods of processing, better packaging and quality control. Some of the products, which can go national are *Pedha, Burfi, Mishti Doi, Rosagolla, Gulab Jamun, Shrikhand, Peda, Kunda and Podo.* The

There is scope for both co-operative and the private dairy sectors to strive to obtain necessary certification, which will enable them to enlarge their International market.

manufacture of *chhana podo* is presented in Fig.6. *Chhana podo* blocks are shown in Figs 7 (a) & (b) and characteristics in Table 2.

Adoption of Newer Processes

There is continuous development taking place in the food processing industry. Newer processes are being developed for adoption by the food processing industry. Some of the newer processes which can be adopted for the production of varieties of newer milk - based products are the membrane processing, UHT processing, high pressure treatment, hurdle technology and bactofugation process. These processes are likely to contribute for newer products and also for improving the commercial shelf - life of the existing dairy products.

Pasteurised milk
↓
Cooling
(32^0C)
↓
Addition of starter
(*S.thermophilus* + *L. bulgaricus* @ 1.0 - 2.0%)
↓
Renneting
(0.8 - 2.5 g/100 lit of milk)
↓
Cutting
↓
Cooking
(45 to 47^0C in about 45 min ; 0.16% acidity)
↓
Draining of whey
↓
Ripening of the curd
(0.6 - 0.7% acidity)
↓
Milling
↓
Addition of hot water
About 80^0C
↓
Kneading and stretching
↓
Moulding
↓
Brining
(24% Nacl, 8 - 10^0C for 1 - 3 days
depending on the size of curd block)
↓
Ripening
(13^0C for 3 weeks)
↓
Storage
(4^0C, 2 - 12 months)
↓
Paraffining
↓
Packaging

Fig.4. Flow diagram for the manufacture of Provolone cheese

Milk
↓
Standardisation
(Fat, 1.0 - 3.0 %)
↓
Condensation
(TS, 32 -36%)
↓
Cooling
(38 - 40^{0}C)Addition of stabiliser (CMC, 0.015%)
↓
Homogenisation
(Temperature, 38 - 40^{0}C
Pressure, 100 bar)

Receiving ripe banana
↓
Peeling
↓
Cutting
↓
Addition of water
(1.0 - 1.5%)
↓
Heating
(85 - 90^{0}C/5 - 10 min)
↓
Cooling
(38 - 40^{0}C)

Mixing
(batch -wise)
↓
Homogenisation
(Temperature, 38 - 40^{0}C
Pressure, 50 bar)
↓
Spray drying
(Inlet temperature, 160 - 180^{0}C)
Outlet temperature, 85 - 95^{0}C)
↓
Blending with ground sugar
(42.5%)
↓
Packaging
↓
Storage

Fig.5. Flow diagram for the manufacture of ready - to - use banana milk shake powder

Fig. 7 a) Chhana Podo *before baking (left) and after baking (right)*

Fig.7 b) A view of Chhana Podo

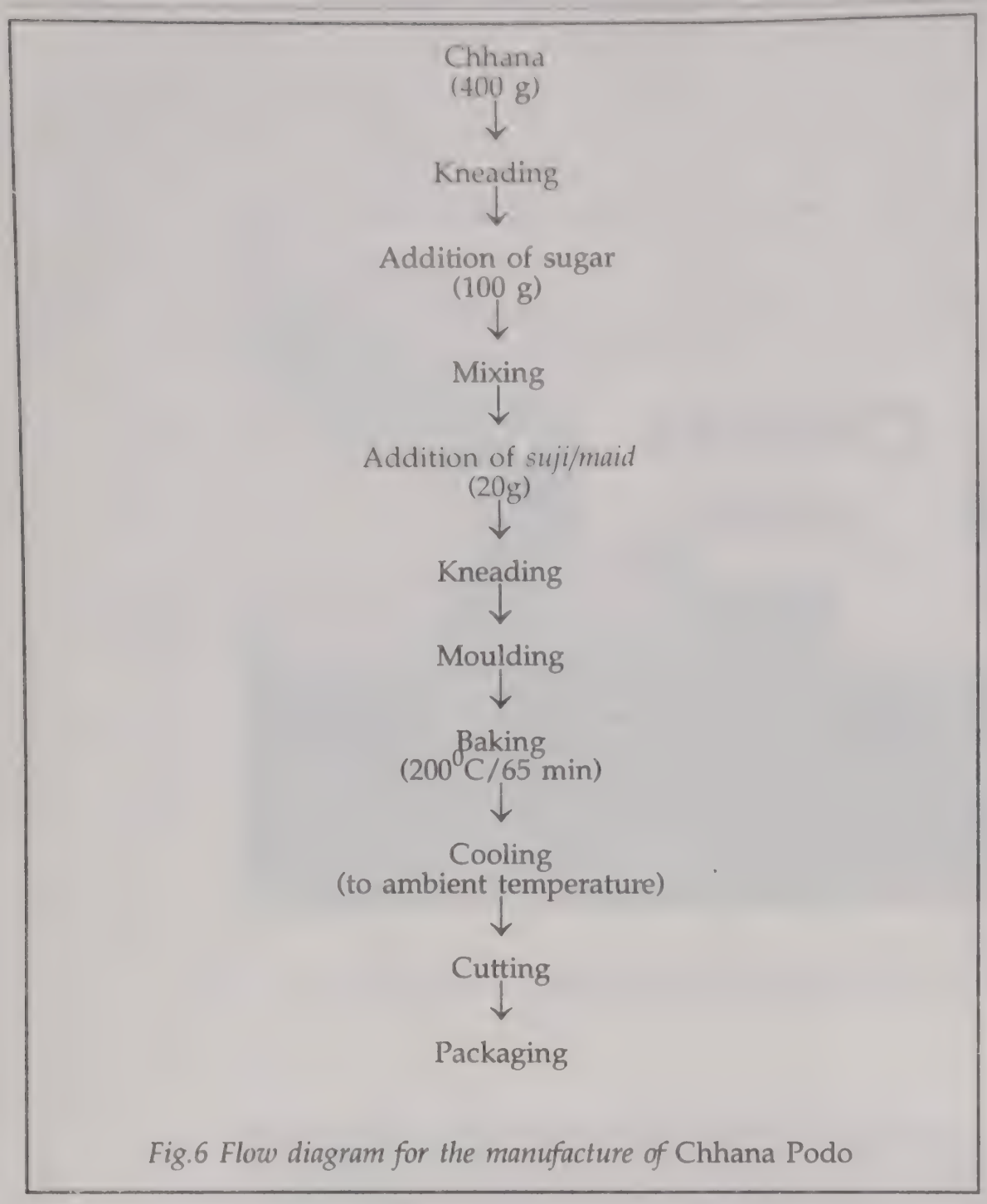

Fig.6 Flow diagram for the manufacture of Chhana Podo

Certification System

As the world is getting integrated to one market, quality certification systems are becoming increasingly essential. However, there is no dairy plant in the country which has successfully obtained ISO/HACCP certification. In this direction, there is scope for both co- operative and the private dairy sectors to strive to obtain necessary certification, which will enable them to enlarge their International market.

Conclusion

There is scope for introducing newer products by adopting newer processes by the dairy industry in the country. There is also need to obtain necessary quality certifications from International organisation to face the international challenges in the expanding market. The National Dairy Research Institute can support actively any effort made by the dairy industry in this direction.

Challenges in the Packaging ..... continued from page 28

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Propiono-Acido-Bifido (PAB) Milk - A New Cultured Milk for Infants

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Introduction

Breast milk is considered superior over other modified milk formulae due to its inherent properties and advantages (Jelliffe, 1975; Baggott, 1975). In spite of these inherent properties and advantages, breast milk is deficient in vitamins, iron and calcium (Barrie, 1976). Further, AIDS was found to get transmitted through breast feeding (Anon, 1992). Under these circumstances, cows and buffalo milks could be humanized compositionally for infants, but could not be adapted fully to the composition of human milk due to structural differences in proteins and fat (Schmidt, 1975). Technological innovations made in the commercial infant milk powder have not been able to meet the critical nutritional and physiological needs of infants (Thompkinson and Mathur, 1995). In the absence of nutritionally competent infant foods and inadequate production of breast milk, cultured milk products could be a suitable and practical substitute for infants owing to its nutritional and therapeutic properties. A number of cultured milk products viz., yoghurt, acidophilus milk, bifidus milk, bulgarian milk, kefir etc. have already been developed and recommended for infant feeding. The various cultured milk products developed for infants have been reviewed by Sarkar and Misra (1996). In this article, a process for the production of a cultured milk containing probiotic cultures like *Bifidobacterium bifidum* and *Lactobacillus acidophilus* with other beneficial cultures such as *Propionibacterium freudenreichii* subsp. *shermanii* for feeding infants and children has been described. Its chemical, dietetic and nutritional characteristics are also presented.

In the absence of nutritionally competent infant foods and inadequate production of breast milk, cultured milk products could be a suitable and practical substitute for infants owing to its nutritional and therapeutic properties.

Dietetic Characteristics of Cultures

Dietetic characteristics of *L.acidophilus, B. bifidum* and *P. freudenreichii* subsp. *shermanii*, which led to suggestions for their use as dietary supplements are highlighted below :

L. acidophilus (Speck, 1975) and *B. bifidum* (Misra and Kuila, 1994) are known to retain its viability through the digestive tract and thus affords a means of implantation in the intestine.

Elaboration of bacteriocins or bacteriocin - like compounds such as acidophilin, acidolin by *L. acidophilus* (Shahani *et al.*, 1977), bifidin by *B. bifidum* (Anand *et al.*, 1984) and microgard ™ by *P. freudenreichii* subsp. *shermanii* (Al-Zoreky *et al.*, 1993) proved to be inhibitory towards undesirable microorganisms of public health. Inhibition of coliforms, *B. cereus, Shigella dysenteriae* and *Salmonella typhimurium* by antimicrobials elaborated by mixed cultures of *L. acidophilus, B. bifidum* and *P. freudenreichii* subsp. *shermanii* have been observed by the authors.

Synthesis of vitamins such as folic acid by *L. acidophilus* (Stockstad and Koch, 1967), vitamin B_1, B_6 and folic acid by *B. bifidum* (Liebscher, 1961; Hamada,

1966) and thiamine, vitamin B_6, B_{12} and nicotinic acid by *P. freudenreichii* subsp. *shermanii* (Skupin *et al.*, 1974) induce an improvement in the nutritional qualities of cultured milks.

Fermented milk contains both D (+) and D (-) lactic acid and both isomers improve the digestibility of casein and retention of calcium in the intestine (Krusch, 1978). Ballabriga *et al.* (1970) suggested that infants should be given only L (+) lactic acid to prevent acidosis. Kay (1974) reported production of a mixture of 60-70% L (+) lactic acid and 30-40% D (-) lactic by *L. acidophilus* and *L. helveticus*. However, in bifidobacteria - based fermented milk, the amounts of desired L (+) lactic acid dominated to a level of 90% (Klupsch, 1983). Therefore, milk cultured with these cultures would be safe for infant feeding.

Proteolytic activity has been demonstrated by *L acidophilus* (Misra *et al.*, 1997). *B. bifidum* (Misra and Kuila, 1991) and *P. freudenreichii* subsp. *shermanii* (Brendehaug and Langsrud, 1985). Proteolysis induced an increase in free amino acid content (Rasic *et al.*, 1971), improves the digestibility of proteins (Breslaw and Kleyn, 1973) and absorption of calcium, phosphorus, magnesium and zinc (Schaafsma and Dekkar, 1987).

Galactosidase enzyme, responsible for hydrolyzing the naturally occurring (1-6) linked galactosidase has been demonstrated in *L. acidophilus, B. bifidum* (Premi *et al.*, 1972) and *P. freudenreichii* subsp. *shermanii* (Kujawski *et al.*, 1990). A decline in lactose content and an increase in lactase activity due to β-galactosidase activity of starter cultures make fermented milk more suitable for lactose-intolerant infants.

Manufacture of Propiono-Acido-Bifido (PAB) Milk

A schematic diagram conceptualizing the procedure employed for the manufacture of Propiono-Acido-Bifido (PAB) milk is shown in Fig - 1.

Formulated milk was obtained by fortifying standardized cow's milk (2.5% fat, 10.46% SNF) with 500 IU vitamin A, 80 IU

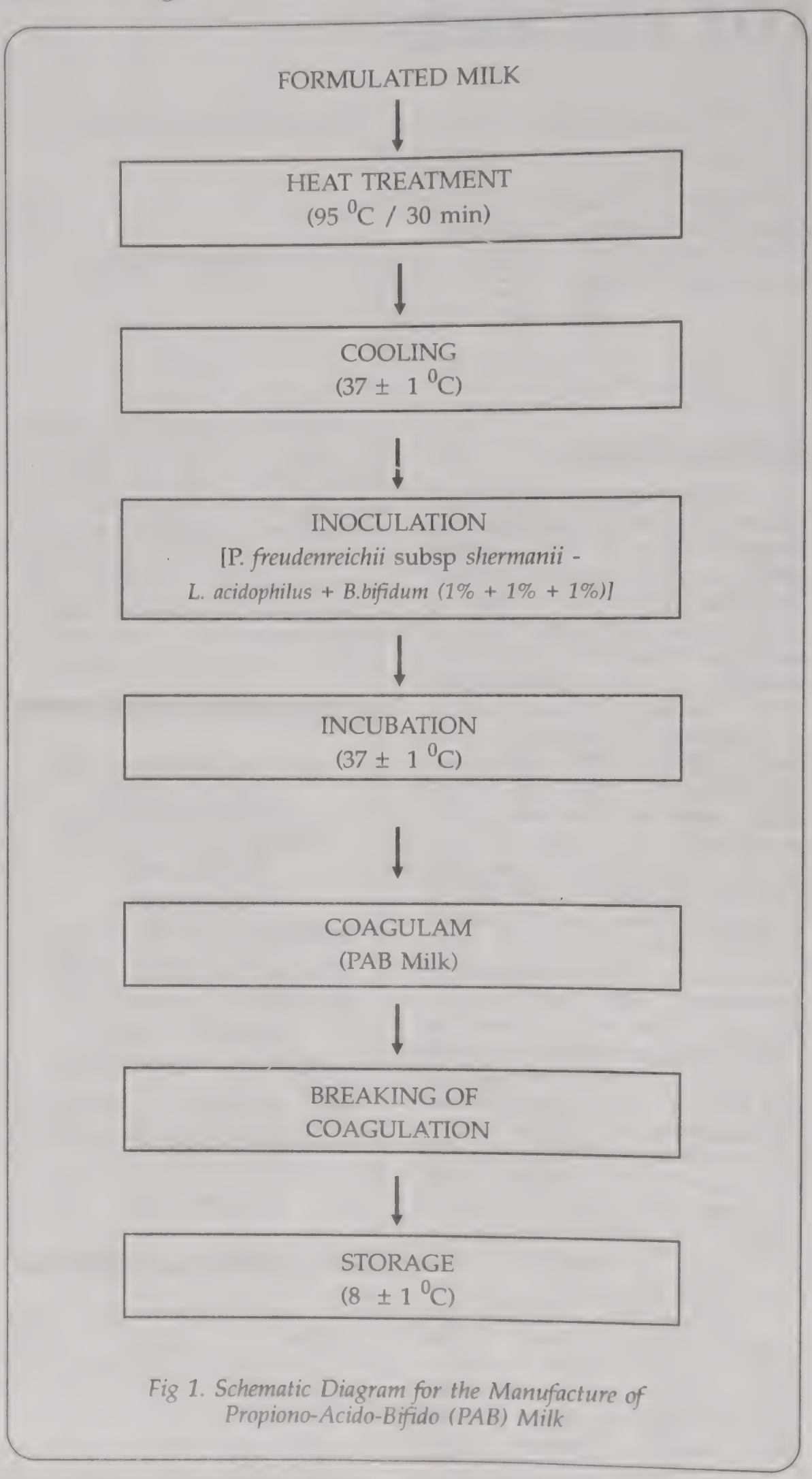

Fig 1. Schematic Diagram for the Manufacture of Propiono-Acido-Bifido (PAB) Milk

vitamin D and 750 mg vitamin E. Milk was sweetened by admixturing 12% sucrose as suggested by Misra and Kuila (1992). The milk was then heat-treated at 95^0C/30 min and cooled to 37 ± 1^0C for starter inoculation. *L. acidophilus* R, *B. bifidum* N D R I and *P. freudenreichii* subsp. shermanii MTCC 1371 were inoculated at 1% level, individually and incubated at 37 ± 1^0C for 12 h to obtain PAB milk. PAB milk retained all its desirable properties upto 7 days of storage at 8+ 1^0C.

Chemical and Technological Characteristics

Freshly prepared PAB milk had 2.1% fat, 3.66% proteins, 7.84% carbohydrates, 0.60% ash and 1.39% titratable acidity. The diacetyl and acetoin contents along with the volatile acids contribute to the characteristic aroma and flavour of the product. Volatile acidity remained almost unchanged but the diacetyl and acetoin contents increased significantly during 7 days of storage (Table - 1).

Dietetic Characteristics

Proteolysis in the product increased but the lactic acid content remained constant during 7 days of storage (Table -1). Increase in proteolytic activity in the product indicates better digestion and increase in biological value of proteins. β-galactosidase activity present in PAB milk indicates its suitability for consumption by lactose-intolerant infants. PAB milk had lactobacilli, bifidobacteria and propionibacteria counts in the range of 10^8 cell/ml required for successful seeding in the intestine, even after 7 days of storage (Table-1). Several workers have reported that for successful seeding in the intestine, the viable population must be in the range of 10^8 - 10^9 cells/ml of the product (Tanaka *et al.*, 1982; Kim, 1988).

The product also showed desirable antibacterial activity against different test organisms, namely *Salmonella typhimurium, Shigella dysenteriae, Bacillus cereus* and *Escherichia coli* (Table-1). PAB milk containing 10^8 cells/g, given to healthy infants, for a period of 7 days after meals, showed a decline in coliforms and an increase in bifidobacteria and lactobacilli counts in their stools. Results indicate adherence and multiplication of *L. acidophilus* and *B. bifidum* in the intestinal tract of infants.

Nutritional Characteristics

Nutritional characteristics evaluated by rat bioassay technique revealed higher weight gains, feed efficiency ratio, protein efficiency ratio and net protein ratio in rats receiving PAB milk than those fed with laboratory stock diet (Table-2). Better nutritional status of PAB milk was due to presence of easily assimilable

Table 1. Technological and Dietetic Characteristics of Propiono-Acido- Bifido (PAB) Milk

Characteristics	Days of storage at 8 ± 1^0C		
	0	3	7
Titratable acidity (% lactic acid)	1.40	1.60	1.80
Volatile acidity (ml 0.1 N NaoH/50 g curd)	1.90	2.00	2.10
Diacetyl and acetoin (ppm)	13.00	26.00	50.00
Proteolytic activity (mg tyrosine/ml)	208	280	325
Lactic acid (mg/ml)	220	220	220
β-D-galactosidase activity (mg ONP/ml)	44	18	16
Propionibacteria count x 10^8 (cfu/ml)	1.80	1.83	1.84
Lactobacilli count x10^8 (cfu/ml)	2.12	2.17	2.22
Bifidobacteria count x 10^8 (cfu/ml)	2.05	2.10	2.14
Antibacterial activity (Diameter of zone of inhibition in mm)			
Salmonella typhimurium	7.50	7.00	7.00
Escherichia coli 03	6.50	6.00	5.50
Bacillus cereus	7.00	7.00	7.50
Shigella dysenteriae	9.00	8.00	8.50

Table 2. Nutritional Characteristics of Propiono-Acido-Bifido (PAB) Milk

Nutritional atributes	Types of feed: Laboratory stock feed			PAB milk		
	Intervals of analysis (days)					
	10	20	30	10	20	30
Average gain in body weight (g)	20	2	6	30	12	10
Feed Efficiency Ratio (FER)	0.066	0.008	0.018	0.093	0.035	0.020
Net Protein Ratio (NPR)	0.006	0.002	0.002	4.34	1.61	1.28
Protein Efficiency Ratio (PER)	0.004	0.001	0.001	3.20	1.28	0.68

Note : Average initial weights of rats were 45-50 g.

proteins, resulting from proteolytic activity of starter cultures. The protein efficiency ratio (PER) of PAB milk was higher than buffalo milk - based commercially available infant formula and for low-lactose infant formula standardized by Bindra (1979) and Paul and Mathur (1993). Thus, PAB milk is nutritionally adequate for feeding infants and children.

Conclusion

A dosage of 100 g of PAB milk containing 10^8 cells/g of probiotic cultures, once in a day after meals for a period of 7 days can be recommended to provide lactic acid, antibiotic factor and live bacteria in addition to better nutrition qualities supported by addition of *P. freudenreichii* subsp. *shermanii*. The combined action of these factors will create favourable conditions for the proliferation of intestinal bifidobacteria and lactobacilli and discourage the growth of harmful organisms in addition to providing improved nutrition. The information obtained during this investigation seems to have high potential for application in the production of fermented milks by the food industries.

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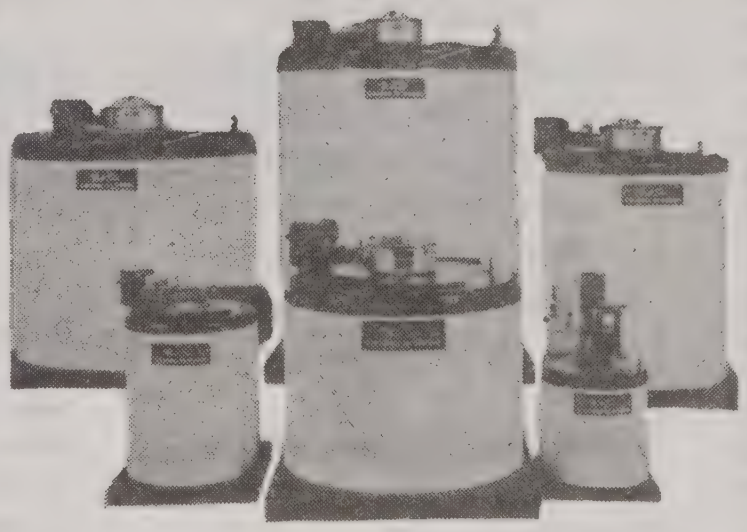

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Formulation of A Dry-mix for *Paneer* - based Convenience Food

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Introduction

Ready-to-eat foods are without doubt the most convenient foods to serve and consume. A packet is dipped in scalding water or a tin is cut open or a bottle is flicked open and the food is ready. However, the dry mixes of several Indian dishes are very popular not only in India, but also in other countries. A few examples are, *idli* mix, *vada* mix, *sambar* mix, spice mixtures of fried rice, *upma* mix, *avial* mix, *kheer* mix etc. The popularity of these foods can be gauged by the fact that separate manufacturing units are being established in Middle East (Anon, 1990, in U.K. and Singapore. Also, these products seem to have export potential as scores of agencies are presently engaged in this trade with U.S.A., U.K., Canada and Gulf countries.

An attempt was made in this laboratory to explore the possibilities of producing a convenience food based on *paneer* (*paneer curry*) using a dry-mix. Since *paneer curry* contains *paneer* cubes and gravy, the easy way is to dry the mix. The wet ingredients have to be dried and dry-mixed with other ingredients. Thus, the process involves 1) drying of tomatoes, onions, garlic and ginger 2) drying of *paneer* and 3) dry-mixing of all the ingredients.

An attempt was made in this laboratory to explore the possibilities of producing a convenience food based on *paneer* (*paneer curry*) using a dry-mix.

Drying of Tomatoes, Onions and Garlic

Tomato pieces were spread in a try and dried in an oven at 75^0C for 8 h and subsequently the temperature was lowered to 60^0C and dried further for 8 h. Onion pieces were dried at 60^0C for 24 h and the garlic pieces for 48 h. The dried material was ground in a mixer and sifted through a 44 mesh-sieve. The procedures were based on those described by Feinberg *et.al.*, (1964). Since, the tomato, onion and garlic powders are very hygroscopic, sufficient care was taken during mixing operations to avoid caking.

Drying of Paneer

Drying of *paneer* posed several problems. When dried at 60^0C for 12 h fried *paneer* became very hard, considerable amount of fat oozed out, reconstitution was difficult and reconstituted *paneer* was tough and rubbery. The same was true with raw *paneer*. Similar observations were made by Vishweshwaraiah (1987) and Sachdeva (unpublished work). In order to overcome such problems, Intermediate Moisture Technology was adopted to preserve the *paneer*.

One hundred grams of fried *paneer* cubes were equilibrated with 500 ml of 6% sodium chloride and 1.5% potassium sorbate solution by boiling in it for about 20

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min. The equilibrated *paneer* cubes were then dried at 60^0 for 6 h. The moisture content of the partially dried *paneer* was about 27%.

Formulation

In the course of development of product in dried form, several difficulties with regard to flavour, consistency, colour, free flowing properties etc. were encountered. In order to overcome such impediments, many preliminary trials were carried out and improvements made. A final formulation has been finalised. The ingredients used and their quantities are listed in Table 1.

Rehydration

About 100 g gravy powder and 100 g dried *paneer* were mixed with about 800 ml water and boiled to a slightly thick consistency. Salt requirement of the product was met by the salt present in fried *paneer*, which diffused out during boiling. The final weight was made upto about 500g by evaporation to get *paneer curry*.

Composition

Composition of gravy powder and Intermediate Moisture (IM) *paneer* was determined separately. Gravy powder consisted of 93.84% TS, 8.1% fat, 11.45% proteins and 3.52% ash. The carbohydrate and crude fibre as estimated by difference was 70.77%. IM *paneer* possessed 73.17% TS constituted by 40.38% fat, 20.1% protein and 7.85% ash (including 5.1% sodium chloride) (Table 2). The carbohydrate and potassium sorbate content as calculated by difference was 5.42%.

When the gravy powder and IM *paneer* were packed together, the former being very hygroscopic, the mixture attained thermodynamic equilibrium by transfer of moisture from IM *paneer* to gravy powder. In order to avoid such undesirable caking of gravy powder, both the components were contemplated to be packed separately.

Table 1. Ingredients for 1000 g of Dry-mix of *Paneer Curry*

Ingredient	Quantity (g)
Hydrogenated fat (vanaspati)	79.3
Bay leaves	3.2
Cinnamon powder	1.6
Garlic powder	31.2
Spice powder	12.7
Chilly powder	3.2
Coriander seed powder	9.5
Onion powder	47.5
Tomato powder	79.3
Rice flour	23.8
Skim milk powder	23.8
Turmeric powder	1.6
Sodium glutamate	0.8
Citric acid	0.4
Intermediate Moisture *paneer*	63.5

Sensory Evaluation

The dried product rehydrated as described above was served to 18 judges and their response was recorded on a 9-point Hedonic scale. The frequency of their reaction is shown in Table 3. Ten out of 18 judges liked the *paneer* extremely/very much and 6 liked it moderately, whereas 5 judges liked the gravy very much and 7 moderately. Six judges relished the gravy slightly or disliked it. It has to be noted that *paneer* which presented major obstacle in formulating the product was liked by all the judges. Several comments were made by the evaluators and some of them are listed below :

- the product is very much acceptable
- *paneer's* body and texture are very good
- very good idea
- *paneer* and gravy have slight off-flavour
- gravy has slight bitter after taste
- product's colour is not so appealing
- there is no typical flavour
- gravy should have been slightly acidic
- spices are not well balanced

On the whole, the product remained acceptable, though several suggestions were made to improve it further. The average scores of *paneer* and gravy respectively were 7.64 and 6.80.

Conclusions

This study, though a preliminary attempt, demonstrates that it is possible to produce an acceptable quality dry mix of *paneer curry* by admixture of dried ingredients. There is a scope for further improvement of the product by using an appropriate balance of selective spices. However, the product's stability has to be checked and rehydration characteristics have to be evaluated during storage. In preliminary trials, it was noted that the IM *paneer* lasted for over 3 months at room

Table 2. Chemical Composition of Dry-mix of *Paneer Curry*

Constituent	Gravy powder	IM *paneer*
Total Solids	93.84	73.17
Fat	8.1	40.38
Proteins	11.45	20.10
Ash	3.52	7.85
Sodium Chloride	-	5.10
Carbohydrates+crude fibre	70.77	-
Carbohydrates+potassium sorbate	-	5.42

Table 3. Sensory Scores of *Paneer Curry* Prepared by Rehydration of the Dry-mix

Acceptance Level	No. of Judges	
	Paneer	Gravy
Like Extremely	3	-
Like very much	7	5
Like moderately	6	7
Like slightly	2	5
Neither like nor dislike	-	-
Dislike slightly	-	1
Dislike moderately	-	-
Dislike very much	-	-
Dislike extremely	-	-
Total	18	18

temperature. Packaging requirement needs to be taken into consideration as the gravy powder is hygroscopic. The IM *paneer* and dry gravy have to be packaged separately to avoid caking of gravy powder, possisbly caused by a large difference in water activities of IM *paneer* and gravy powder. These studies open up new vistas for research in preservation of dairy products by Intermediate Moisture Technology. For example, in this study also fried *paneer* has been preserved by partial drying and at the same time reducing its water activity and preventing bacterial growth. Addition of potassium sorbate prevented the possible occurrence of mould growth. By these treatments, not only is the microbiological shelf-life of fried *paneer* improved, but also its rehydration characteristics which would have been severely affected by complete dehydration, were retained.

This study, though a preliminary attempt, demonstrates that it is possible to produce an acceptable quality dry mix of *paneer curry* by admixture of dried ingredients.

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New Protech Engineers Pvt Ltd, vegetable oil processing consultants, designs and supplies turnkey projects for oil mills, refineries, hydrogenation and extraction plants. The manufacturing system includes various plants. The solvent extraction plant is continuous, automatic, versatile for processing different types of seeds, viz., rice bran, soybean, sunflower and all type of oil seeds and oil cakes. The seed processing system comprises seed intake, seed storage, seed control, seed cleaning, seed preparatory with squeozomatic autorun expanders, flakers, cooler, drier cooler, etc, which give good result and high performance in production of oil. Two configuration of vegetable oil refining plant are available, i.e., batch type and continuous version, which are equipped with neutraliser, bleaching deodourisation, dewaxing, acid oil, caustic refining, deacidification, vanaspati/ghee, industrial oil hydrogenation, fat splitting units. After the commissioning of the plant, service and supports for additional equipment and spare are also extended to suit one's needs and requirements. Feed plants are designed for two main application, namely cattle feed and poultry feed. New Protech Engg has the capacity to design balanced feed plants in both modular and vertical manner to suit specification. The capacities can range from a medium 100 TPD to a large 1,000 TPD plant. Apart from these, the company also undertakes project construction, process and mechanical design for chemical process plant, bulk drug, formulation, beverages plant and distillation plant. Latest process design software are used for designing of equipment and process for chemical industries and edible/inedible oil process plant design. The Knowel type electrolytic cell used for the hydrogen gas generation is one of the unique systems that this company has developed in-house and this is an ideal hydrogen gas generation plant for vanaspati manufacturing units and other industries.

For more details write to :
New Protech Engineers Pvt Ltd
20-71/C Sunder Bldg, Ng Acharya Marg
Chembur, Mumbai - 400 071

On-line Oxygen Analysers

Artech offers high-performance low-cost analysers for measuring oxygen levels from 100 down to fractional percentage levels. Based on galvanic cell sensors, the analysers come in two versions : Model OA-11, with a working range of 0-30% oxygen, and Model OA-12, which can be used from 0 to 100% oxygen. Digital readout of concentration and dual alarms are standard features. Each alarm channel is provided with a set of changeover relay contacts. The alarm set points can be set and displayed from the front panel. A needle valve regulator and a flow indicator enable the user to regulate sample gas flow from the front panel. Applications include : air separation plants, cylinder gas quality, fruit storage, food packing machines, medical monitoring, purge gas monitoring, landfill gas, and nitrogen-purged soldering systems.

Fore more details write to :

Artech Labs

A-3 Udyog Sadan No 3 (Seepz), Central Road

MIDC, Andheri (East),

Mumbai - 400 093

Compact Flour Mill

Tradepoint offers the DFM Compact Flour Mill, based on a short- milling process developed in Austria. With this patented DFM technology, various cereals (wheat, maize, sorghum, etc) can be milled with the same set of equipment, a disintegrator (pin-mill) processing the grain in one pass. All units of the DFM mill are ready-assembled in containers and are, if desired, mobile. The capacity of standard mill sizes ranges from 45 kg/hr through 900 and 1800 to 2700 kg/hr. For start-up, it needs only connection to a water and electricity main. The simple and rugged technology ensures a favourable cost-benefit ratio.

For more details write to :

Tradepoint Handels GmbH

Geylinggasse 30, A-1130 Vienna, Austria

Infrared Thermometer

M B Control & Systems has introduced the Infrared Thermometer, Model TM-908, a low-cost micro-processor-based instrument for non-contact temperature measurement. These instruments are particularly suited to measuring temperature in electrical panels, rotating drums, moving objects, food and beverages and other applications. It has a range of -10^0 to $+300^0$C with resolution of 1^0C for -10^0 to $+300^0$C and 0.1^0C for -10^0 to 110^0C. Temperature scale can be selected between C and F. Accuracy is +2% of reading. Emissivity can be adjusted between 0.10 and 0.95. Memory is available in the instrument to store maximum, minimum and average. The lightweight portable instrument works on 9 V DC battery and comes with IR sensor and carrying case.

For more details write to :

M B Control & Systems Pvt Ltd

31/1, Ahiripukur Road,

Calcutta - 700 019

UV-VIS Spectro - photometer

The scanning DR/4000 UV-Vis spectrophotometer from Hach Co, USA, that makes analysis easier and convenient has innovative sample modules, which are slid in and out for manual testing, multi- position carousels, pour-through cells or sipper system. It has sophisticated software, which can call up programs and wavelength with just a few key strokes. This instrument is driven by an advanced interactive user interface. It has more than 130 pre-programmed calibrations that are permanently stored in instrument's memory. A large graphical display shows graphical representation of a wavelength scan. Peaks and valleys are available in tabular form. It has elegant chemistries which give fast, accurate, convenient testing results, when used with Hach simplified methods and prepared reagents. It is available in ultra-violet and visible spectrum models. The resolution and accuracy are outstanding with specified wavelength measurements. The read out values can be chosen in concentration, ABS or %T. It can scan any wavelength range, perform time course operations, or use innovative standard addition function to check for accuracy. It is ideally suited for both routine, demanding applications in water treatment, industrial process, surface finishing, food beverage processing, pharmaceutical production and chemical synthesis. It has an RS232 interface for computer compatibility.

For more details write to :

Orbit Technologies Pvt Ltd

404, 4th Floor, Taramandal Complex, Saifabad

Secretariat Road

Hyderabad - 500 004

Datalogging Spectro-photometer

Hach Company, USA, has introduced the DR/2010 datalogging spectrophotometer that offers advances in performance, convenience and economy. New capabilities include the ability to store, recall, and print up to 1,000 sample readings. The information that can be reported includes program number, parameter, units, concentration, date, time group number, sample number, and absorbance or %T. The recalled data may be sorted by parameter, concentration, date group number or sample number. The group number would be useful in identifying an individual operator or location where testing involves multiple operators, sample sites, or facilities. Other advantages include a simplified user interface, reduced reagent usage on many procedures, a microprocessor that is eight times faster than existing Hach's DR/2000 spectrophotometer and the ability to easily upgrade software with a program disk at the user's site. The DR/2010 spectrophotometer is designed for laboratory or field use and operates on either line power or batteries. Hach also offers 12 different DREL portable laboratories, which are equipped with a DR/2010 and the reagents, appratus and labware required for specific water quality monitoring applications. The spectrometer comes with 120 preprogrammed methods including 18 new Hach methods, and can store upto 50 custom calibrations. A visual display guides users step by step through a procedure.

For more details write to :

Orbit Technologies Pvt Ltd

404, 4th Floor, Taramandal Complex, Saifabad

Hyderabad - 500 004.

Infrared Moisture Balance

Toshniwal Infrared Moisture Balance is a reliable and sturdy instrument for an accurate determination of the moisture contents of materials, which do not undergo chemical changes when exposed to infrared radiation. Since drying and weighing of samples are done simultaneously, the instruments is specially useful for substances, which quickly reabsorb moisture after drying. Observations can be taken quickly and the results obtained are accurate. The instrument is suitable for a reliable determination of moisture contents of agricultural soils, foods, chemicals, plastics, pharmaceuticals, construction soils and other similar materials. The balance consists of a 250 watt infrared lamp, a sensitive torsion balance and solid state control unit, all housed in a compact cabinet mode of solid cast aluminium, having robust design. The infrared radiation from the lamp is used for heating the sample. The temperature is controlled by solid state device. The instrument is directly calibrated in percentage of moisture between 0% and 100%. Thermometer is provided to monitor the temperature near the test material.

For more details write to :

Toshniwal Brothers (Delhi) Pvt Ltd

3E/8, Jhandewalan Extension

New Delhi - 110 055

Freeze Dryer

Pharmalab offers the Amsco/Finn-Aqua Lyovac range of freeze dryers. The compact system of dryer is ideally suitable for lyophilising natural products, peptides, proteins, solvent - based products, etc. It is built on modular concept and is of two-chamber designed with microprocessor controls. The dryer's design offers GLP and enables to carry out PRM to determine the end of drying cycles and BTM for getting precise temperature of the product. The microprocess is provided with an interface for data recording and offers precise control on lyophilisation process. The R&D freeze dryer is available in 14 models for lyophilising products in vials/ampoules/bulk/bulbs/ or combination. The refrigerant used is environmental friendly.

For more details write to :

Pharmalab Engineering India Ltd

Star Metal Compound, LBS Marg

Vikhroll (West), Mumbai - 400 083

Continuous Oil Skimmer

Oil Skimmers Inc, USA, offers a versatile device for continuous skimming/removal of waste oils, vegetable oils, animal fats, oily froths and other contaminants from water, coolants, cleaning solutions, etc. The skimmer picks up oil through an exclusive "floating tube" made from a special polymer, which selectively attracts oil; hanging from the machine, the tube floats on the liquid in a closed loop. The system drives the floating tube peripherally over the liquid surface. The oil-covered portion comes to the top, is cleaned through scrapers and goes down again to the liquid surface, to collect more oil. The system can work continuously without any attention. Features include : safe mounting above the tank edge and clean lifting of oil up to the top from a depth of 80-100 ft (24.4-30.48 m); high pick-up-light oils at 900 litres per day (LPD), medium oils at 2,200 LPD and heavy oils at 5,400 LPD; high purity of the collected oil and

residual water; no monitoring of water/oil levels, machine position, secondary pumping, skimming speed, solid clogging, etc; unaffected by solid waste, floating debris and variations in liquid levels (Pick-up area is spread over a 6-8 ft zone or 1.8- 2.4 m zone) slow, gliding motion of the tube does not disturb the oil/water interface essential for effective skimming; simple design needs only 1/2 HP motor, consuming very low power; durability and low maintenance. These skimmers are useful in steel and aluminium mills, metal machining and manufacturing, heavy industries, food, chemical, petrochemical and oil processing/handling/transport industries.

For more details write to :

JVM Marketing Pvt Ltd

6/205 Jogani Industrial Complex,
Off Sion-Chembur Road

Near ATI, Sion (East),
Mumbai - 400 022

Industrial Dehumidifiers

The Flama heavyduty industrial dehumidifiers (Moisture Magents) are designed to solve a host of problems associated with excessive moisture in a number of industries (such as textiles, electronics, pharmaceuticals and food processing), in telephone exchanges, record rooms, museums and laundries, in low- temperature drying, curing, seasoning and storage facilities. The elimination of excessive humidity can expedite printing, bindery and packaging and protect steel components in process or storage. The dehumidifiers, which dry air automatically without messy chemicals, are available in three models with moisture removal capacity up to 50 litres/day.

For details write to :

Flama Progress Industries,

Z - 52 Okhla Industrial Area,
Phase II

New Delhi - 110 020.

Solar Water-Heating System

Soltherm Energy offers a compact solar water-heating system. The system can be used in canteens (for cooking and dish-washing), in industries (bottle- and can-washing, boiler feed water, etc), hospitals and hotels (laundry, bathing, cooking, dish-washing, etc). Hot water output is 1,000 litres per day at 60^0C in the smaller systems (using 6 collectors) and 2,000 litres per day at 60^0C in the larger systems (using 12 collectors). For periods when the sky is not clear or cloudy, an electrical back-up is provided. Larger industrial systems (up to 25,000 LPD) can be built on a turnkey basis. Other products manufactured include : domestic solar water-heating systems, solar distillation systems (stills), solar lanterns and other energy-saving devices.

For more details write to :

Soltherm Energy (B) Pvt Ltd

3, 1st Floor, Bhagyshree,
Opposite New English School

Ram Maruti Road,

Thane (West) - 400 602,

Maharashtra.

Industrial Valves

Venus Enterprises offers a wide range of Leader industrial valves including GM & GI gate, globe, check valves (ISI/non/ISI), boiler mountings viz., junction stop valve, safety valve, PRV, NRV, globe, blow down, strainers, feed check valves, steam traps, water level gauge, injector with IBR TC and CCS/FCS high pressure and high temperature gate, globe and check valves with IBR TC. These valves are available in sizes from 6 mm to 750 mm and pressure rating to ASA Class 150, 300, 600, 800, BS-10 Table F, H, JJ, DIN Std Nd-16, 40 with screwed,socket weld and flanged connections. Applications are in industries such as heavy chemical, pharmaceutical, sugar, fertiliser and petrochemical, cement, pulp & paper, edible oil refineries, solvent extraction plants, dairy projects & distilleries.

For more details write to :

Venus Enterprises

122, Narayan Dhuru Street,
Mumbai - 400 003

Cover : Britain's Dentron Ltd. at Hampshire has developed a food-preserving process which uses electrically charged air particles to kill microbes responsible for food decay and obviates the use of preservatives. Tests on slices of chicken, contaminated with salmonella, have proved the high efficiency of this award-winning technique and its capacity to reduce the risk of food poisoning as well as extend the shelf-life of food without altering taste and texture. Potential applications include cooked and uncooked meats, fish, fruits, vegetables and even spices. Some types of food packaging could also be sterilised by the process.

Source : LPS Weekly Newsletter; issue - 23, 16 Sept. 1997

NEW PRODUCTS

Ozone Technology

Ozonetek Ltd offers a state-of-the-art ozone technology. Ozone is the most powerful oxidising agent used for advance oxidation, disinfection and colour and odour removal. The only raw materials are atmospheric air and very low electric power and the by- product is oxygen. The company offers this technology for a wide range of applications including drinking water disinfection for use in municipal water treatment; in mineral water plants; packaged, automatic and maintenance - free water purification plants from 100 LPH to 1,500 LPH for use in hotels, housing complexes, offices, hospitals; in swimming pool water to reduce chlorine usage by 70% to 90%; in cooling tower water treatment to completely eliminate chemical treatment; in effluent treatment to reduce BOD, COD; reduce colour and odour; disinfection of sea foods, meats, fruits, vegetables and processed foods for export industry, aqua culture industry. The applications are endless. Ozonetek offers ozone technology for any application and for any capacity.

For more details write to :

Ozonetek Limited

30, Landons Road,

Chennai - 600 010

Ion-Exchange Resins

Auchtel manufactures ion-exchange resins, viz., strong acid cations, macroporous (gel), weak acid cations, strong base anions, weak base anions, adsorbent resins; chelating resins; nuclear grade resins; high purity resins; general applications; water softening; demineralisation, condensate polishing, etc; colour removal, deashing of glucose, fructose, dextrose, deacidification of glyoxal, etc; brine purification, mercury removal, heavy metal recovery; isolation & purification of pharmaceuticals; and organic chemicals like gentamycin, streptomycin, sorbitol, glycerine, citric acid, vitamins, etc.

For more details write to :

Auchtel Products Ltd

Poonam Chambers, North Wing, 7th Floor

Shivasagar Estate, Dr A B Road, Worli, Mumbai - 400 018

Hygienic Plastic Disposable Gloves

Kachrulal manufactures the Suraksha hygienic plastic disposable gloves. The HMHDPEZ gloves are disposable, hygienic, non-toxic and free of plasticisers, tough but soft, and easy to wear (requiring no powdering) and can be used on any hand. These can be used in chemical and pharmaceutical units, food and dairy industries, pesticides handling, engineering units, hospitals and clinics, research laboratories, beauty parlours, etc. Also, manufactured are gloves in EVA which can be used for medical examination, disposable aprons, shoe covers and face masks.

For more details write to :

Kachrulal Vinaykumar Abad

PO Box 94, 2-20039, Abad Marg, Jalna, 431 203, Maharashtra

100% Graphite Packing

The Floget-Pg is a 100% pure graphite packing. Made from special graphite (over 99% carbon) yarn and coated with a graphite lubricant, this packing is impervious to most corrosive acids and caustics, and is specially suited for use in severe service conditions and high temperatures up to 600^0C. It is manufactured by Floget Engineers, Baroda.

For more details write to :

Flojet Marketing Pvt Ltd

H-201 Ansa Industrial Estate, Saki Vihar Road

Sakinaka, Mumbai - 400 072

Perfumery and Flavour Compounds

Ultra International manufactures industrial perfumery and flavour compounds, aromatic chemicals and essential oils for use in cosmetics, toiletries, pharmaceuticals, food and beverages and in tobacco, pan masala, soaps and detergents.

For more details write to :

Ultra International Pvt Ltd

304 AVG Bhawan, M-3 Connaught Circle

New Delhi - 110 001

NEW PRODUCTS

Multilayer Co-extruded Packaging Films

Rotoflex (formerly Nilkamal Poly Packaging) makes co-extruded multilayer films, used as packaging material for products ranging from pasteurised milk to pan masala.

For more details write to :

Rotoflex Industries Ltd

2nd Floor, Asarpola Chambers, C G Road, Navrangpura

Ahmedabad -380 009, Gujarat

Teflon-based Grease

India Lubricants offers a Teflon-based grease, the Tefrolon. The grease forms a thin microscopic film on moving metal parts, creating a shield of very smooth yet strong surfactant, which can resist extreme pressure and continue to lubricate, when the carrier grease has evaporated. Available in four grades of varying temperatures from 250^0C to 700^0C, it is used in ball bearings, gearboxes, gears, die casting machines, spring assemblies, pumps, valve stems, turbines, fuel supply systems, electrical items, food processing machinery, marine equipment, etc.

For more details write to :

India Lubricants

243, Annuparpalayam,
Coimbatore - 641 009,
Tamil Nadu

Air Bubble-Cushioned Packaging Material

The Airplast air bubble-cushioned packaging material is a strong, flexible and shock-absorbent 2-layer LDPE cushioning-packaging material. It eliminates damage to product in transit, minimises packing cost and handling time. It can be tailor-made into pouches, cut-pieces, ABF-lined mailing envelopes, etc., to suit applications, reducing design time and inventory of packaging for various applications. Available in all 4 international bubble dia (6, 10, 20 and 30 mm), it finds applications in industries ranging from electronics and computers to pharmaceuticals, glassware and machine tools and machinery and also in domestic packaging and packaging fruits and vegetables.

For more details write to :

Tender Care International

C-12/12A, Shreyas Indl Estate,
Behind Jay Coach
Goregaon (East),
Mumbai - 400 063

Herbal Biscuit

Arya Vaidya Pharmacy, Coimbatore and AVP Marketing and Exports have launched what is claimed to be the first ever herbal biscuit. The biscuit, aptly named 'Ojus' is a mix of selected herbs and its ingredients include the well known Ayurvedic tonic 'Chavanaprasam' to promote good health, rejuvenation, stamina and strength.

The Department of Diabetics and Nutrition, Avanashilingam Deemed University, Coimbatore, after testing the biscuit for nutritional value has found that it is rich in proteins and calcium. Also, launched are a herbal candy 'Hit Kitch" and a herbal toffee 'Aswas', both containing 'Thaleesapatradi Choornam', a traditional medicine for sore throat and colds, aimed to benefit children and adults, respectively.

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RESEARCH ROUND-UP

Calcium Enriched Milk

A generous calcium intake is essential for bone growth and helps stave off diseases like osteoporosis. Drinking milk helps, but often is not enough. So researchers at Muji Milk Products (Tokyo,Japan) and Darsco Foods International in Minnesota (USA) have joined forces to develop a calcium supplemented milk drink that still tastes like milk.

There are two problems with boosting the calcium content of milk. If the supplement in the form of soluble calcium salts, gives the milk an odd chalky taste. If the calcium salts are insoluble, they make the drink feel gritty, no matter how small the-salt particles. The team got around this problem by using calcium salts present in whey.

The team started with whey, the watery waste product from cheese making. Whey contains calcium salts mainly phosphate and citrate. The researchers obtained these salts by first removing protein and casein from the whey. The protein is stripped away by ultra filtration, while the casein is precipitated out of solution by 'seeding' it with tiny casein crystals. The remaining solution is then concentrated 10-fold by ultra filtration and mixed with defatted milks. The milk retains its characteristic taste and texture because of the unique structure of the calcium salts in the whey. The salts are neither fully in solution nor crystalline, but have a unique 'net work' structure. As this is not ionic, it cannot react with the proteins in the milk to form precipitate and as it is not crystalline, it will not make the liquid gritty.

Impact of Biotechnology on Dairy Products

Certain genetic elements have been found recently that produce those half food/half pharmaceutical components such as human lactalbumin and lacto ferrin that make cow's milk more like human milk, improving immune system function and fighting disease. Work in transgenic mice, cows and goats is beginning to look promising as a way around the extremely high price tag attached to conventional ways of making these proteins.

Several companies are actively engaged in this research work, with Abbott and Ciba Geigy being in the front. While infant formulas are the obvious use of proteins, products for the growing number of immune compromised persons are expected to become commercially important, particularly as the population in several countries continues to age and as the population with immune system damage increases.

Deodorised Garlic-Based Antibacterial Spray for Food Products

Garlic essence (U.S.Pat.5453 420) is produced by extracting garlic with ethanol and is deodorised with phytic acid. The essence has high anti-bacterial activity when sprayed on to food, and can thus be used as a food preservative. The essence is used alone or in combination with E-polylysine at a concentration of 1-256 Mg/ml.

A Faster Production of Fructose on the Research Horizon

Fructose is the sweetest natural carbohydrate. It is natural low calorie sweetener. There are numerous steps in the process of extracting fructose from corn, rice and potato. Most of the fructose is used in the form of high fructose corn syrup (HFCS). Now researchers at the University of Notre Dame (Indiana, USA) have found a technique to combine the last two steps of the extraction process of fructose and simultaneously increase the final fructose levels. The first step involves wet milling the vegetable matter to extract the starch. The starch is then hydrolysed, either enzymatically or with mineral acid, in a process known as 'saccharification'. This syrup is isomerised at 60^0C using an immobilised enzyme called glucose isomerase, which converts the glucose to fructose. This is world's largest industrial enzymatic process.

This results in a syrup that is 42% fructose. The fructose level is then enriched to 55% by an ion-exchange process. The new technique is based on a liquid membrane supported in plastic that combines the isomerisation and fructose enrichment steps.

The raw syrup is on one side of the membrane with the glucose isomerase enzyme, while the processed material collects on the other side. The separating membrane is a thin flat sheet of porous polypropylene impregnated with an oily solution of boronic acid. The syrup enters the pores of the polymer where the sugar molecules quickly bind to the boronic acid. The boronic acid holds fructose more firmly than glucose. So these molecules are carried across the membrane more quickly than glucose.

The fructose begins to disappear from the raw material and enters the collection tank, which encourages the enzyme to convert more glucose into fructose. The process is continuous because removing the fructose encourages the enzyme to convert more glucose. The research team has also tested a plasticized polymer, which seems to be just as effective but lasts much longer. This may help in upgrading the laboratory process to a commercial scale in future.

Effect of Feeding Soy-based Formulas on Infants

Soyabean-based infant formulas can contain such large amounts of estrogen like chemicals, that infants fed soya formulas exclusively are being exposed to doses six to 11 times higher than doses known to have hormonal effects in adults, U.S. scientists report in a recent issue of The Lancet.

Those naturally-occurring plant estrogens, called phytoestrogens, are far weaker than estrogens made by the human body, but because the blood levels of the phytoestrogens in these infants were so high-13,000-22,000 times higher than of the infants's own estrogen levels, the researchers conclude that the phytoestrogens from soya-formula "must have some biological activity in the infant".

A Simple Method for Detection of Edible Oil Adulteration

A Scientist from the National Institute of Nutrition (NIN) Dr.S.Babu, has developed a simple, specific, rapid and cost- effective method for detection and quantification of castor oil in edible oils. The method is based on the optical activity of ricinoleic acid, a major constituent of castor oil. The optical rotation is measured by an instrument known as polarimeter.

Dr Babu, in his experiments, has found that ricinoleic acid, a special fatty acid, is not present in the other edible oils such as cottonseed, coconut, mustard, olive, palm, peanut, ricebran, safflower, soybean and sunfloweer. The method cannot be applied to sesame oil because it also exhibits slight optical activity. Three other NIN scientists, Mr. R.V.Sudershan, Mr. R.K.Sharma and Mr. Ramesh V.Bhat, had helped Dr. Babu in the development of the new method. According Dr.Babu, the advantage of his method is that there is no need for sample processing for detection of adulteration. The sample can be analysed in less than a minute by filling a tube with test sample and placing it in the polarimeter for recording optical rotation.

Rancid oils and the presence of any amount of free fatty acids will not interfere in the detection of castor oil, because they are optically inactive. The method also does not require solvents and chemicals for analysis.

According to Dr. Babu, a classical polarimeter was available in the market at a price ranging from Rs. 10,000-Rs 20,000, while the latest digital display polarimeter would cost about Rs. 4 lakhs-Rs 5 lakhs. The price of the device would be much less if a portable one was developed. (Polarimeter is like a telescope developed by Mitscherlich in 188. While the optical phenomenon was discovered by a French physicist Franqois Arago).

Adulteration of edible oils with cheaper oils or toxic oils has been reported in the past from different parts of the world. A recent survey, conducted in the State food laboratories spread all over India, indicated that castor oil is the major adulterant in edible oils because it is cheaper than other vegetable oils. The consumption of castor oil is known to have deleterious effects on human health.

However, the methods hitheto available for detection and quantification of castor oil are time-consuming, need elaborate extraction procedures and sophisticated instruments. Rancid oils interfere in the analysis and give false-positive results. Because of these limitations in the analytical procedures, food control authorities often fail in their attempt to legally prosecute the traders involved in willful adulteration.

Hence, Dr. Babu's method is expected to be very useful for the food control authorities in checking adulteration of edible oils and bringing the culprits to book. The method could also be useful to large-scale consumers of edible oils who can afford to buy polarimeters.

Pesticide Residues Cause Nervous Disorders

Defence Food Research Laboratory (DFRL) at Mysore is a premier institution engaged in food processing and supplying food to defence personnel serving in remote places such as the Siachen Glacier. One of the objectives of the research done at the DFRL is to check adulteration and remove toxic residues in food products before they are processed and supplied.

Dr.S.S. Arya, DFRL Director, and Dr.S.Jayaram, food scientist, said that pesticide residues in food could cause harm. They told that despite three-fold increase in the use of pesticides in the last two decades, its utilisation per hectare was still the lowest in the world. But, the rate of intake of food containing pesticide residues in the country was among the highest in the world. "This is largely due to the post-harvest abuse of agrochemicals on fruits and vegetables".

They said that Rs. 6,600 crores worth of crops are lost due to pest attacks. Lack of modern agricultural methods and drawbacks in integrated pest control management had resulted in pesticide residues in food products reaching alarming levels. The unchecked abuse of pesticides had resulted in the target species developing resistance to pesticides.

There are nearly 120 pesticides in use. Their utilisation is governed by the Pesticides Act, 1968. The Prevention of Food Adulteration Act, 1954, prescribes the maximum limits of pesticide residue permissible in different foodstuffs. But due to the absence of a surveillance system, there is no control over the use of banned pesticides or excess residue in foodstuffs.

In a developing country such as India, which depends on agriculture, it would be difficult to end abuse of pesticides as the farming community is governed by the cost factor and not the risk factor.

It is said that there is pesticide abuse even in the godowns of the Food Corporation of India (FCI). Dr. Arya and Dr. Jayaram expressed the doubt that instead of fumigation, banned dusts are being used in the godowns of the FCI.

Dr. Jayaram said that of all the pesticides, fungicides such as benomyle. carbodaezim, capdan and thiram, which are mainly used as post- harvest preventive chemicals, are the deadliest and are largely found in vegetables and fruits. Besides DDT and BHC, aldrin, chlorodane, heptachlor, dibromochloropropane, toxaphene, pentachloronitrolbenzene, methyl parathion, nitrofen and paraquat dimethyl sulphate were in the list of banned compounds.

Dr.Jayaram said that it was a miracle that the people in India had developed no major health problem due to pesticide residue in food. Even cattle milk powder were not free from these poisonous chemicals.

Anticarcinogenic Properties of Black and Green Tea

Black tea, as well as green tea, could have significant anticarcinogenic properties, according to scientists of the Food Safety Research Group at the University of Serrey near London. A paper in the scientific magazine Nature (volume 387, 5 June 1997) reported US researchers' findings that a substance found in green tea, the catechin epigallocatechin-3 gallate (EGCG), inhibits an enzyme known as uPA, which is strongly linked to cancer.

Professor Ron Walker of the University Surrey said EGCG is also present in black tea in significant amounts, with 15 per cent of the catechins remaining unchanged after the fermentation from green tea to black tea. In addition, other components of black tea also possess anticarcinogenic properties.

Research by the British group has shown that during the change from green to black tea, new substances are generated, which themselves have potent antimutagenic activity. These substances, theaflavins and thearugigins, protect against free-radical induced damage to cells.

Black tea, it is claimed, has also been shown to have anti- carcinogenic properties through several biochemical mechanisms including inhibition of the metabolic activation of pro-mutagens and scavenging of electrophilic mutagens. Additionally, both green and black tea contain flavanols and flavones, which act as free- radical scavengers and protect against degenerative changes in the human body.

These findings explain the antimutagenic and anticarcinogenic properties which are observed in black, as well as green tea, said Professor Walker.

For More Information: Professor Ron Walkar/Dr Costas Ioannides, Food Safety Research Group, University of Surrey, Guildford, United Kingdom, GU2 5 XH. Telephone:+44 1483 300800; fax: +44 1483 509389.*Courtesy: British High Commission*

Role of Milk Against Cancer

Just when people are finally learning to tolerate, if not enjoy, skim milk, non-fat yogurt, fat-free cream cheese, cottage cheese and sour cream, comes this finding from an Australian nutrition researcher: and that is cows'milk fat contains a number of cancer inhibitors.

So if you are trying to cut down fat to save your heart and figure, you may also be eliminating beneficial fat.

The researcher who works for the Dairy Research and Development Corporation in Victoria had his results published in the Journal of the American Society for Nutritional Sciences. None the less, he has amassed an impressive array of evidence of the cancer- inhibiting ability of numerous components of dairy fat.

Among the substances in milk fat shown in laboratory and animal studies to impede the growth of various human cancers are conjugated linoleic acid, sphingomyelin, butyric acid and ether lipids. For example, the researcher said that conjugated linoleic acid, an essential fatty acid not produced by the human body, inhibited growth of cell lines of human malignant melanoma, colorectal cancer, lung cancer and breast cancer. "Milk fat is the richest natural source of conjugated linoleic acid," the study reported.

In addition to substances naturally present in cows's milk fat, the study found that dairy cows extracted other potential anticarcinogens from their feed and transferred them to milk. These include beta carotene, beta ionone and gossypol.

Food Additive That Can Help Dieters Developed

A British pharmaceutical company has announced what it describes as one of its "most exciting projects" in the diet food area. It consists of an additive that can be incorporated into many food products. Its key property is that it is able to slow down intestinal movements.

As a result, there is a pleasant feeling of fullness that can result in immediate reduction of 20 to 40 per cent in calorie consumption, says Dr Bengt Herslof, the managing director of Scotia Lipid-Teknik (SLT), part of Scotia Holdings plc, of Stirling, central Scotland.

The material can be added to many different foods to achieve this effect. A yoghurt has been successfully test marketed in Sweden and will be introduced into the Swedish market later this year by a large milk company.

SLT has developed numerous technologies to develop a range of ultra-pure specialist lipids-naturally-occurring fats and oils- for pharmaceutical and nutritional products that needed new solutions to particular problems.

Nature repeatedly uses lipids to solve problems such as the production of cell membrane in living tissue, formation of seeds that will remain fertile for long periods, production of milk containing a full range of essential nutrients or formation of egg yolk to provide nutrients for an embryo bird.

SLT's research into creams and emulsions, for cosmetic, pharmaceutical and nutritional purposes, for example, is extensive because of the need to avoid the risk of allergic reaction or side-effects as well as to meet personal preferences, such as the wish by some people to avoid using animal products or for those who have difficulty in swallowing capsules.

Scotia Holdings plc, Scotia House, Castle Business Park, Stirling, United Kingdom, FK9 4TZ.

For More Information:

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Fax: +44 1786 895450.

Courtesy: British High Commission

Increasing the Milk Yield of Cows

Water beds for cows increase milk yield, save money as well as being safer and more hygienic, according to farmer Alan Bristow. His patented design now being manufactured uses rubber similar to that used in conveyor belts. The bed, which costs 98 pounds sterling is delivered empty to the farm and are then filled with water and sealed. The cows then use the beds during winter months, when the animals have to be brought indoors.

Mr Bristow has tested out the water beds on 286 of his Holstein Friesians at his 810-hectare (2,000-acre) Baynards Park, at Cranleigh, Surrey, southern England. He saves 54,000 pounds sterling on not having to buy straw for the cows. But the animals no longer have damaged knees, or cuts and bruises which they used to suffer from. The beds also simplify mucking out and reduce the chance of any possible infection.

The Scottish Agricultural College, based in Edinburgh, the capital of Scotland, is to examine the question of cow bedding this winter. It plans to compare the reaction of two groups of 60 cows to either rubber-filled mattresses or the more common thin rubber mats. Milk yield and the time

spent lying down will be part of the study.

For More Information:
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GU6 8EQ.
Telephone: +44 1483 277170.
Courtesy: British High Commission

The Scottish Agricultural College, West Mains Road,
Edinburgh, United Kingdom,
EH9 3JG.
Telephone:+44 131 535 4000.
Courtesy: British High Commission

Edible Fat from Yeast in Curds

Yeast present in fermented milk and several flowers and fruits can churn out edible fats and oils, according to a report. Microbiologists from Gujarat University, Ahmedabad, have found that lipid production from yeast present in these sources ranged from 24 to 71 per cent. Yeasts can thus emerge as possible alternate sources of bio-oils to supplement edible oils and fats from plants. They produce oils similar in composition to edible plant oils, the scientists report.

The Gujarat University studies showed that curd contained a yeast *Candida* which contained high amounts of lipids -over 70 per cent-in its cells. Besides curd, yeast cells isolated from fruits such as apples, bananas, grapes and plums contained about 25 per cent lipids in their cells, the researchers reported in the *Indian Journal Of Experimental. Biology.* The scientists, Preeti Thanker and N.K. Yadav, have also outlined a process to isolate and optimise production of *Candida.* They found that lipid production was optimum, when the yeast cells are grown on a nutrient medium containing five per cent glucose as carbon source and one per cent ammonium sulphate as nitrogen source, at a temperature of 28 ^{0}C.

Heparin from Seaweed

Researchers at Annamalai University's Centre of Advanced Study in Marine Biology have extracted heparin, a substance which prevents blood from clotting, from seaweed.

Heparin is a naturally occurring substance widely used as a drug to prevent clotting in situations such as when a heart valve has been surgically replaced and during dialysis. At present, it is extracted from the lungs of cattle and intestine of pigs.

A group of scientists at the Centre of Advanced Study in Marine Biology at Porto Novoscreened 16 species of seaweeds for heparin content and found that two species looked promising.

Some 434,000 units of heparin could be extracted per kg of dry seaweed from *Acanthophora Spicifera* and 465,000 units per kg from *Hypnea Valentiae,* according to a paper published in *Current Science.*

Dr. A. Subramanian, first author of the paper published in *Current Science,* said that there were still some impurities in the heparin extracted from seaweed, and the process had to be improved to remove them.

Fluorescence *Vis-a-Vis* Food Safety

The National Environmental Engineering Research Institute, at Chennai, with its modern facilities, has been conducting research on viruses for over a decade. The researchers, led by Dr. Jothikumar, , screened about 60 phages (viruses that are capable of infecting bacteria) and based on their experience, they laid down conditions such as specificity (to attach to a selected bacteria), lysogeny (capacity to dissolve bacterial cell walls) and presence of double stranded DNA, to select one which will do the job on hand.

The virus selected also contained an enzyme for fluorescence-a process by which light is emitted when some other form of energy is shone on it-emitting blue light.

In their assay, the virus is allowed to infect and transfer the viral genes to the virulent *E. Coli* 0157 : H7 through a process known as transduction. This makes the bacteria also to fluoresce in select substrates. The infected bacteria is then allowed to incubate and develop overnight.

Later, when UV light is shone on it, the bacteria fluoresces emitting blue light. A rapid detector for this bacteria in water or food has a read-out time of 8 hours.

The method can be used to detect other forms of bacteria also, for example, leptospirosis, which causes jaundice and T. *Bacillus* which causes TB, which are of concern to developing nations.

"The new method developed by NEERI, and named Gene Transducing phage Assay is fast and completely reliable," says Dr. Jothikumar. "It can detect the virulent type of *E. Coli* overnight. Another advantage is that it detects only the living pathogen and not the dead cells of the bacteria."

There is also a lot of business opportunities arising out of this work because of outbreaks of *E.Coli* 0157 : H7 being reported worldwide. There is an immediate need for a commercial detection kit/assay to improve surveillance of water/food contamination and so the laboratory is in the process of getting an U.S. patent.

Red Meat and Cancer

A Committee on the Medical Aspects of Food and Nutrition (COMA), based on a broad survey carried out by 15 experts for the World Cancer Research Fund recommended that those who eat an average 90g of red meat a day, less than a quarter-pound hamburger, should consider a reduction and those with a high intake of around 140g should definitely cut back. The committee, which has been examining the links between diet and cancer in the UK also stressed the importance of maintaining a healthy body weight and increasing intakes of a wide variety of fruit and vegetables and fibre.

Changing the diet could reduce the global incidence of cancer by 30-40 per cent a year. In Britain, this could prevent 100,000 cases of cancer each year.

A healthy diet, together with regular exercise and maintaining a healthy body weight, could reduce the three most common cancers - cutting lung cancer cases by up to a third, halving breast cancer and preventing three-quarters of colon cancers, according to the survey.

It says that people should eat no more than 80g of red meat a day and recommends a daily intake of 400-800g fruits and vegetables and 600-800g of cereals and pulses, combined with an hour's brisk walk, no alcohol and no smoking.

Consumer-Friendly Animal Products

The U.S. Poultry & Egg Association funded a research project to investigate modification of the lipid and cholesterol content of poultry meat and eggs. The fatty acid composition of the egg yolk and poultry meat can be modified or designed through manipulation of the poultry feed. It is reported that dietary incorporation of copper sulphate or copper citrate (250 mg/kg of diet) or garlic powder (3 per cent) decreased the cholesterol content in the blood and tissues. Hens fed 30 percent oat bran or 3 per cent cottonseed hull had decreased egg cholesterol. Similarly it is possible to reduce cholesterol and increase omega-3 fatty acid content of eggs and chicken by feeding menhaden oil (fish oil) or rapeseed or flax seed (linseed).

Meat from ruminant animals (beef, mutton) contain predominantly saturated fat because of inherent biohydrogenation of ingested lipids in the rumen by the rumen microorganisms. Several feed additives are available to modify the carcass composition to satisfy the health conscious consumers.

First Tissue Culture Grown in Space

A U.S. astronaut on the Mir space station grew the first tissue culture in space, which may lead to greater understanding of why zero gravity is so hard on humans, a study has said.

The tissue culture, a project of U.S. astronaut John Blaha, was grown over a four-month period from cartilage cells taken from cattle, according to the study published in the Proceedings of the National Academy of Sciences.

However, the space-grown tissue is weaker than that created by the same technique on earth.

The project "demonstrates the feasibility of cultivating cells-and tissues-in space over relatively long periods of time", writes Ms. Lisa Freed, research scientist at the Harvard-MIT division of health science and technology.

Such research may explain why bones weaken and even crumble in a gravity-free atomosphere. Ms. Freed describes this as a phenomenon which "after more than 25 years in space we still cannot explain".

DATA BANK

Yearwise Production of Fruits in India

(Latest Figures Available) (x1000 MT)

Fruits	1993	1994	1995
Mango	10000	10000	10000
Banana	10460	9242	9500
Orange	2000	2000	2000
Lemon & lime	1300	1500	1700
Apple	1168	1200	1200
Pineapple	859	820	820
Grapes	700	750	750
Papaya	450	470	490
Pears	130	130	130
Citrus	92	92	92
Peaches and Nectrins	83	85	85
Plums	55	56	56
Grapefruit	70	70	70

Source : FAO Production Year book 1995

Yearwise Production of Fruits in the World

(Latest Figures Available) (x1000 MT)

Country	1993	1994	1995
China	31758	35894	39538
India	38274	38434	38912
Brazil	31807	30114	32301
USA	29022	29087	29731
Italy	18980	18286	17494
Mexico	10407	10975	11638
France	10389	11072	11097
Spain	12976	11756	10806
Uganda	8838	9627	10147
Iran	8893	9671	9775
World	388752	390254	396873

Source : FAO Production Year Book 1995

Yearwise Production of Vegetables in India

(Latest Figures Available) (x1000 MT)

Vegetables	1993	1994	1995
Beans green	50	52	52
Cauliflower	4500	4800	4800
Cabbage	3200	3300	3300
Onion dry	3718	4000	4000
Peas, green	267	270	270
Tomato	4600	4800	4800
Garlic	296	350	350

Source : FAO Production year book 1995

Yearwise Production of Vegetables in the World

(Latest Figures Available) (x1000 MT)

Country	1993	1994	1995
China	12556	128630	128650
India	63460	64608	64613
USA	31371	34859	33596
Turkey	18533	19645	21632
Japan	13664	13420	13540
Italy	14090	14333	13178
Korea Rep	11264	10122	10313
Spain	10158	10640	10208
Egypt	9648	10016	10191
Iran	8798	9592	9850
World	473607	484618	487287

Source : FAO Production Year book 1995

TRADE FAIRS & GET-TOGETHERS

Symposium on Advances and Priorities in Fisheries Technology at Kochi from 11-13 February 1998

The Society of Fisheries Technologists (India) (SoFTI) and the Central Institute of Fisheries Technology (CIFT) are jointly organizing a symposium an Advances and Priorities in Fisheries Technology at the Central Institute of Fisheries Technology campus from 11-13 February 1998.

The symposium aims at taking stock of the technological developments and achievements in fisheries sector and to plan strategies for the sustained and planned development of this vital sector in the coming years.

For details, contact

Dr T.S.G. Iyer,

Convenor

Symposium on Advances and Priorities in Fisheries Technology,

Society of Fisheries Technologists (India), Matsyapuri P.O.

Cochin-682029, India

Phone : (0484) 666845 (5 lines)

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XXVth International Horticultural Congress in Brussels from 2-7 August 1998

The XXVth International Horticultural congress will be held in the Benelux-Belgium from 2-7 August 1998. The main objectives of the Congress are to facilitate the exchange of scientific and technical information in all spheres of horticulture and to promote international cooperation. The sub - title of the Congress is "Science and Horticulture; Interfaces and Interactions". The main themes of the congress are :- Culture techniques; Quality of horticultural products; Computers and automation ; biotechnology.

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Resale 1998

April 27th-29th, 1998 at Karlsruhe in Germany

Resale'98-The 4th edition of international trade mart for second hand machinery, equipment and installation is once again equipped for translating its yet another landmark of success at Karlsruhe in Germany between April the 27th and 29th, 1998.

Over the years Resale has paved the way for Indian industries to import machinery and technology necessary to produce high quality goods. The 1998 session of Resale will help Indian industries to upgrade technology, cost effectivity for improving quality, productivity and profitability considering the major constrains of cost, investments etc.

With second hand machines from industrially advanced countries available at low prices, imports have increased from Rs. 340 crores in 1991 to Rs. 815 crores in 1995. This again attributes the importance of the fair for the Indian industries.

The offerings at Resale 1998 will comprise Machinery, Plant, Equipment and Installations to; Metalworking; Woodworking; Plastic Processing; Packaging; Food Processing; Textile; Printing & Paper Processing; Medical Technology; Process Technology; Chemical & Pharmaceutical Plant; Disposals & Recycling; Construction; Agriculture and Ceramic Materials Industries. The other offer will include Commercial vehicles; Other Plant and Machinery; Services; Associations and Organizations and; Trade Journals and Publishers.

. Resale is the solitary, exposition of a peculiar distinction as it has remarkably increased all its statistics in terms of participants and business in just few years, since its introduction in 1995. The things are moving at present for Resale'98 and it is atmost sure and certain that a good one hundred or more exhibitors will display at the fair from all over the world.

International Congress & Symposium on Natural Colorants in Princeton, USA from April 19 to 22, 1998

The Third International Symposium on Natural Pigments for use as Nutraceuticals and Colorants for Foods, Beverages, Confectionery and Cosmetics will be held from April 19 to 22, 1998 at the Hyatt Regency, Princeton NJ (not in Sevilla, Spain as originally planned). It is co-sponsored by the Hereld Organization and the International Association of Color Manufacturers (Washington DC).

Already, well over 100 participants from the U.S., Canada and more than 30 foreign countries have pre-registered for the conference. They are academic and industrial scientists; regulatory, marketing and trade-association personnel, suppliers of colour-measuring instruments/controls and consultants engaged in researching or involved with the production, modification, stabilization, formulation, use, analysis or sale of natural colorants for all applications.

Details of the program are available from The Hereld Organization, 200 Leeder Hill Drive, Hamden CT 06517 Phone/Fax 203 - 281 - 6766

Opportunity for Indian Visitors

A special visit is arranged fro Indian Businessman, Technical Experts and Consultants. Further details can be obtained from The Indo-German Chamber of Commerce, Maker Tower 'E', 1st Floor, Cuffe Parade, Mumbai-400 005 or The official tour promoters in India:
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